The New Zealand

Journal of Agriculture.

VOL. XVII.—NO. 5.

WELLINGTON, 20TH NOVEMBER, 1918.

STUDIES ON THE LIGHTER SOILS OF THE NORTH ISLAND.

II. LIMING OF PUMICE SOILS.

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OF the many ways in which the productiveness of the North Island lands may be largely increased at the present time the most promising appears to be the application of good quantities of carbonate of lime. This may be effected with purchased ground limestone; by marling with a soft unground calcareous rock which does not require reduction by machinery; by using the coarse residue from limestone quarries; or by sea-shells, probably mixed with sand, which have been sufficiently broken by wave-action or other comminuting agents to enable them to be distributed without further treatment. Any one of the alternatives to the purchased product should be obtained at the cost of transport, or at most by the payment in addition of a small royalty.

In the first article of this series, on "Coarse Pumice Soils," published in the *Journal* for October, 1917, the writer gave the results of a series of pot experiments extending over some seven months, using a pumice soil from the Mamaku Experimental Farm, with red clover.

It was shown that ground carbonate of lime applied in quantities which represented both the American heavy dressing and the New Zealand light dressing practices had during the first two months a deleterious effect, reducing the amount of dry matter per pot considerably below the unmanured pots, but that this was succeeded in the following five months of growth by a highly beneficial effect, with the optimum amount of lime applied, not only giving a result two and a half times greater than the control pot, but equalling the result given by basic slag. The following table summarizes the results of the manurial and liming scheme, the figures representing grams of dry matter per pot :—

Period.	Carbonate of Lime.			Guano.	Super.	Slag.	Slag and Super.	Stable Manure.	Control.
	Highest Quantity.	Middle Quantity.	Least Quantity.						
First two months	4·9	6·7	12·2	25·2	26·3	25·4	27·2	25·2	14·1*
Second five months	25·3	26·5	15·3	23·7	22·5	26·5	24·0	26·3	10·6*

* Average of the controls, iron-oxide, and iron-sulphate pots.

It will be seen that the middle quantity of limestone gave as good or a better result in the last five months of the experiment than any other fertilizer, not even excepting stable manure, which would be expected to give the maximum results on poor sandy soils such as this. At the end of the seven months this series of pot experiments was discontinued, but the writer has evidence that the good results of liming with 2 tons of carbonate of lime per acre would have been maintained in field practice for a much longer period, the effect in the case referred to being noticeable after a lapse of seven years.

Another method of ascertaining whether pumice soils would respond to dressings of ground limestone exists in the process developed at the Rothamsted Experiment Station by Hutchinson and MacLennan (*Jour. Agr. Science*, March, 1915). This method the writer was privileged to have explained to him by its discoverers at the time of his visit to Rothamsted in June, 1914, subsequently experimenting with it in the laboratory and adopting it. This method shows that with pumice soils there is a "lime-requirement" figure which varies from 0·1 to 0·4 per cent., which might be roughly translated as from 1 ton to 4 tons of carbonate of lime per acre. Until the foregoing results of the pot experiments were obtained it appeared to be wiser to regard the results of the Hutchinson-MacLennan method as requiring confirmation on pumice soils by other methods, the preliminary effect of lime dressings on some pumice soils in field trials appearing to be not only negative but positively harmful. From various experiments with laboratory, pot culture, and field trials, it now appears certain that ground limestone may not only prove extremely beneficial but necessary for the successful farming of pumice lands, particularly those of the volcanic plateau.

From the following results, which it is hoped to amplify considerably in future contributions, it will be seen that there is a great variation in the lime requirement of the soils of the huge area—several million acres—traversed ; but there is considerable evidence that where a very low lime-requirement figure is given by the analysis there is some

striking petrological change in the country rock which would amply account for the exception :—

LIME-REQUIREMENT FIGURES OF SOILS FROM PUMICE AREA.

(Hutchinson and MacLennan Method.)

Laboratory Sample No.	Locality.	Lime-requirement Figure (per Cent. $CaCO_3$).	
		On Moist Sample.	On Sample dried at 100° C.
H 482	Waerenga Lakeside, Rotorua	0·12	0·14
493	Clayton Road, Ngongotaha	0·24	0·33
501	Kawaha Point, Ngongotaha	0·25	0·33
526	Waiotapu Prison Camp, Kaingaroa Plains	0·17	0·19
543	Lake Rerewhakaitu	0·08	0·08
547	Mair's, 1886 eruption mud (calcareous)	0·03	0·03
639	Ruakomoana, Te Pohue	0·28	0·36
645	Turangakumu, Napier–Taupo Road	0·24	0·30
660	Rangitaike Hotel	0·19	0·20
J 7	Taupo–Napier Road, 7-mile peg	0·18	0·20
10	Runanga	0·19	0·23
58	Tauranga Road	0·32	0·35
60	Tauranga – Te Puke Road	0·20	0·21
64	Matai Road, Rotorua	0·16	0·17
72	Putaruru–Atiamuri Road	0·25	0·28
132	Hatuma, Hawke's Bay	0·07	0·07
K 446	Mamaku Experimental Farm	0·37	0·37
J 62	Matai Road, Rotorua	0·22	0·23
66	Matai Road, Murray's Farm	0·18	0·20
68	Horohoro	0·14	0·17
70	Lichfield Road	0·55	0·70
56	Rotorua–Tauranga Road	0·28	0·31
20	Mokai Road	0·23	0·25
22	Wairakei Flat	0·20	0·22
H 480	Rotorua, Lakeside	0·12	0·13
513	Rotorua–Mamaku Road	0·31	0·38
524	Rotoma Road (not pumice)	0·09	0·10
549	Waiotapu Maori Camp	0·27	0·32
545	Lake Rerewhakaitu (basic scoria soil)	0·08	0·09
532	Waiotapu–Galatea Road, 21-mile peg	0·28	0·33
489	Rotoma (not pumice)	0·12	0·14
484	Tarawera (soil formed from basic scoria)	0·06	0·07
J 14	Runanga	0·30	0·40
16	Kaingaroa Plains, 17-mile peg	0·36	0·40
12	Runanga	0·29	0·43
26	Rotorua–Waiotapu Road	0·33	0·36
24	Rotorua–Taupo Road, 44-mile peg	0·23	0·24
18	Brown's Flat, Taupo–Mokai Road	0·21	0·22
H 666	Rotorua–Taupo Road, 37–40-mile pegs	0·20	0·21
674	Taupo–Galatea Road	0·29	0·33
664	Rotorua–Taupo Road, 46-mile peg	0·21	0·21
H 670	Waiotapu	0·28	0·33
672	galatea Road, 26-mile peg	0·20	0·22
523	Rotoma Road	0·07	0·08
535	Waiotapu	0·49	0·61
515	Mamaku–Mangarewa Road (beech forest)	0·44	0·70
517	Mamaku–Mangarewa Road (no beech)	0·63	0·95
541	Waiotapu	0·61	0·71
537	,, (fern land)	0·28	0·40
539	,,	0·17	0·20
525	Forest, Hongi's Track (not pumice)	0·07	0·06
511	Rotorua–Oteroa Road	0·30	0·49
507	Kawaha, Ngongotaha	0·24	0·30

The percentages of lime required may be roughly translated into tons per acre of lime carbonate by moving the decimal point one place to the right in the results on the moist sample: thus 0·12 per cent. of lime required would mean that 1·2 tons of lime carbonate (ground limestone) at least would be necessary to obtain the best result.

Organic manures, such as dung, stable manure, peat, flax-waste, &c., are generally supposed to be a more suitable amendment to sandy soils than lime, but to recommend organic manures for pumice soils would not be a practicable remedy. In the light porous soils referred to (for a description of which see the *Journal* of May, 1912, p. 374) the best way to reinforce the store of humus would be to grow and plough in leguminous crops, stimulating their growth by limestone and possibly by phosphates. This ploughing-in of green manure has been practised on a pumice soil at the Whakarewarewa Nursery of the forestry administration with gratifying results. In country which has been comparatively recently brought into pasture from the forest, and now used for stock-raising, fattening, and dairying, it is not possible to do much ploughing on account of the stumps. One would therefore have to rely, for increasing the humus, on the residue left in the soil by clovers and other leguminosæ. These usually grow luxuriantly on pumice soils in spite of the entire absence of carbonate of lime in the soil, although by applying it not only may a larger growth be secured, but the food value of the pasture may be much improved.

There is growing upon the writer the conviction that many of the generalizations of European and American writers with regard to sandy soils generally do not hold good for the North Island of New Zealand. One explanation may be that the particles which compose the sands of those continents may have travelled farther and been reduced by weathering agencies to a condition in which quartz (pure silica) is almost the sole mineral constituent; whereas in the North Island, especially on the west coast, even the littoral sands contain comparatively large quantities of potassium and calcium compounds and phosphates, while the volcanic sands of the central volcanic plateau are comparatively unweathered and contain all the original constituents, although in an unavailable form. It appears, therefore, that a moderate application of ground limestone—say, 2 to 3 tons per acre—would effect considerable improvement in pumice soils. Quicklime should only be tried on an experimental scale, as it is likely to destroy the little humus that has accumulated; but where there is a large store, in the case of the black humus pumice soils, there would not be the same objection if bags and transport charges are a consideration. One ton of quicklime, broadly speaking, contains as much calcium as is present in 2 tons of carbonate of lime.

Certainly limestone is a great factor in the formation and accumulation of humus in a warm temperate climate such as New Zealand, and the striking fact shown by Hilgard, that the presence of suitable amounts of lime carbonate in the soil renders smaller percentages of the phosphoric acid, potash, and nitrogen adequate for the growth of crops, should convince New Zealand farmers of the desirability of buying more limestone and less phosphates.

By the Tarawera eruption nature has provided an object-lesson in the value of carbonate of lime by spreading over a large area of

volcanic country mud which contains a few per cent. of carbonate of lime, and these soils are the most fertile and freest from disease of any in the area. Unfortunately, there appears to be no limestone in the heart of the pumice country from which settlers might obtain their supplies, the nearest available deposits being at Te Kuiti. Occupiers of pumice lands may console themselves with the fact that the greater the percentage of clay particles in a soil the more carbonate of lime it must contain in order to possess the advantages of a calcareous soil. While in sandy soils lime growth may follow the presence of 0·1 per cent. of lime, in heavy clay soils not less than about 0·6 per cent. should be present to bring about the same result.

What this "lime growth" is is rather puzzling to New Zealand soil students. In England and the Continent of Europe generally, as well as in America, one finds distinguished writers insisting on the botanical distinctions of calcareous and non-calcareous lands. That is to say, they assert, no doubt with perfect accuracy, that a soil which is inherently deficient in lime is found to be growing certain trees and shrubs, and certain weeds on arable lands and pastures, which are characteristic of a state of lime deficiency. Other trees, shrubs, and herbs are said to be characteristic of soils which at least contain a sufficiency of lime. These distinctions are drawn by men distinguished by their knowledge of the theory and practice of agriculture, as well as by ecologists who specialize purely in the science which concerns the relation of a plant to its environment. Summed up in ecological language, in Great Britain we have to recognize that calcareous soils have a characteristic vegetation marked by a number of species which are rarely found away from them, at least in the same region (or if found away from them occur only on special types of non-calcareous soils), but generally also containing "indifferent" species which are abundant alike on calcareous and non-calcareous soils. In England calcareous soils are very common. In fact, no other geological formation is so widely and uniformly developed as the chalk in English agriculture, and hence there has been ample opportunity for special plants—the so-called calcioles—to evolve. In America Hilgard insisted strongly on the fact that in the Gulf States some kinds of oaks and such trees as crab-apple, wild plum, tulip-tree, honey-locust, juniper, and some others grow constantly on the fertile calcareous soils, while the pines proper are left in possession of the poor non-calcareous soils.

In New Zealand calcareous soils are perhaps the least common of any. Certainly if any general difference can be observed in the botanical composition of the vegetation of limestone areas and those of non-calcareous areas it is so subtle that it has not yet been detected. Certain native plants are probably restricted to limestone, but these are so rare that as "indicative plants" they are of no agricultural value. One striking fact is, however, detected in traversing stretches of wild country in New Zealand, and that is that the feeding-quality of the vegetation undergoes a marked change for the better, if one may judge by the number of wild animals—goats, rabbits, deer, pigs, hares—which a limestone country will support compared with the adjacent greywacke country. One is therefore thrown back on the imported weeds of arable and pasture lands, and upon those few plants common to this and the older countries, with which to test the truth of the plant

indicator method in this country. Of the "calcifuge" species, which are intolerant of much lime in the soil, we are told that examples are maritime pine, Scots pine, sweet-chestnut, gorse, and broom among trees and shrubs; and foxglove, native bracken-fern, spurry, sheep's sorrel, and corn-marigold in the herbs: whereas the characteristic plants on calcareous soils in England are dogwood (*Cornus sanguinea*), beam-tree (*Pyrus Aria*), the wayfaring-tree (*Viburnum Lantana*), traveller's joy (or clematis), guelder-rose, hawthorn, maple, juniper, and hazel among the trees and shrubs, and scabious, bedstraws (*Galium aparine*), vetches, ragwort, and figwort among the herbs. Hall lays stress on gorse and bracken as good indicator plants, denoting a lack of lime in the soil; finger-and-toe or club-root disease among turnips is also reckoned an undoubted evidence of the need for lime; where red clover is rather a doubtful crop the land is held to be somewhat deficient in lime.

Now, in the pumice lands all the pines do well, particularly maritime pine (*P. pinaster*), which is regenerating itself from seed naturally in the Taupo district. Sweet-chestnut and gorse grow well where the climate is suitable. Broom in some parts has taken possession of the country, and the native bracken-fern covers huge areas. Spurry and sheep's sorrel are also common. The corn-marigold and foxglove were not observed. Of calcioles, the only ones noticed were hawthorn, growing to very fine trees on Te Ngae Farm—a calcareous wind-borne soil. Ragwort certainly belies its reputation for denoting calcareous soils, for one of the largest areas of ragwort in New Zealand occurred near Okoroire on a pumice soil, and it is certainly spreading throughout the pumice area. Red clover, too, is usually successful on pumice.

The evidence as given by the plant covering of the pumice lands is therefore contradictory as to whether they should be regarded as supporting a calcifuge or a calciole vegetation, but the writer considers that the bulk of the evidence is in favour of the calcifuges, and therefore that if any deductions can be drawn from the vegetation it is that it supports liming as a treatment.

One of the most comforting ways in which the farmer may salve his conscience for his sin in neglecting to apply the great healer—lime—to a sick soil is to fix his attention on the harm which may possibly result from applying an excess. But he will have to shut his eyes very tightly to the fact that it is quick or burned lime which does the harm, if any. To do permanent harm with carbonate of lime would require such an enormous quantity that he is never likely to commit that fault. Then, of course, his solicitude for posterity might also provide a solace. "Lime enriches the father but impoverishes the son," says the proverb. Here again "lime" does not mean limestone, and posterity is more likely to revere the ancestor's memory if he adopted as his motto "A limestone country is a rich country," and did his best to make it so.

NOTE.—The writer has been informed that some farmers have recently had difficulty in obtaining limestone and lime, as owing to the great demand for them the works could not fulfil the orders. He would be glad if Farmers' Union or other officials in charge of large districts desiring lime would write him on this matter, reporting any shortage.

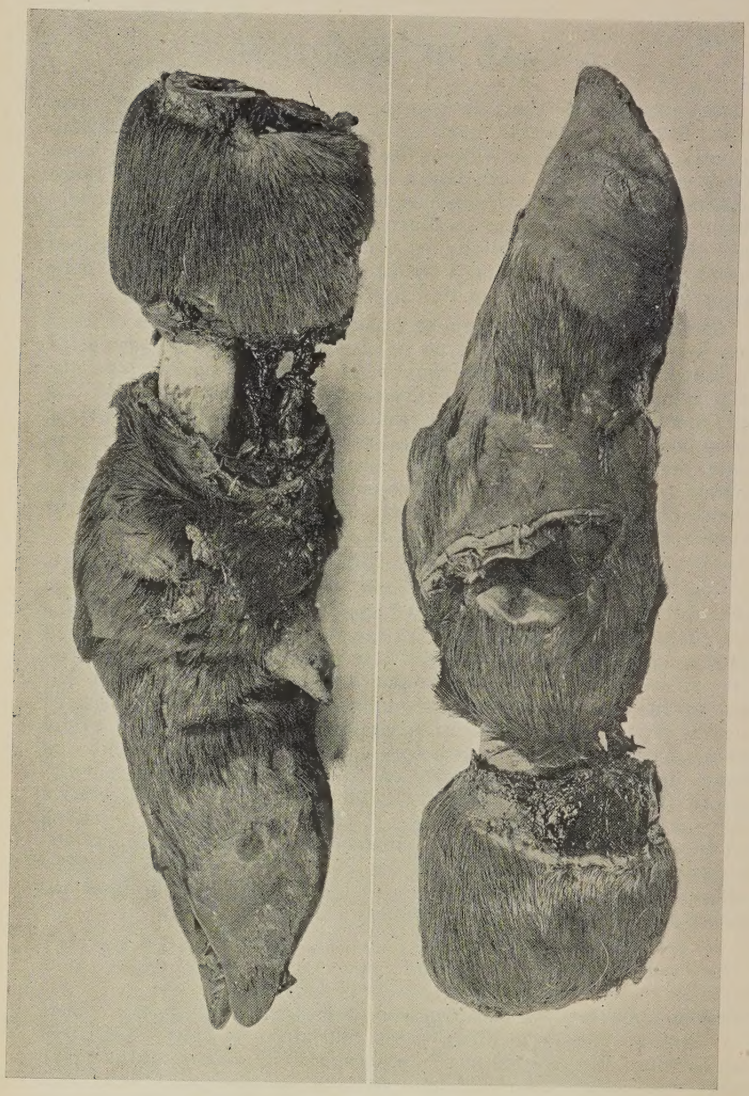
A CASE OF ERGOTISM.

A PARTICULARLY well-marked instance of the effects of ergot upon cattle is furnished by a case which has been reported by Mr. J. Halligan, Inspector of Stock, Woodville. The animal in question had been grazing in a paddock containing a quantity of tall fescue (*Festuca arundinacaea*), a variety of grass upon which ergot is very commonly found. As will be seen by the illustration on the following page, the whole of the soft tissues of the leg had become dead and mummified below a point a little distance above the fetlock, leaving the bone exposed for nearly an inch of its length.

This condition is brought about through the specific action of ergot in causing contraction of the walls of blood-vessels, thus impairing the circulation and preventing the parts receiving proper nourishment, the result being what is known as dry gangrene. The effects of this impairment of the circulation are naturally most pronounced at the extremities. A clear line of demarcation forms between the healthy tissues in which the blood-supply is still sufficiently good and the gangrenous portion, and in the present case the gradual shrinkage of the affected part has produced the appearance illustrated by the photograph.

This case, occurring as it did towards the end of winter, supports the opinion formed as a result of a series of experiments carrried out in 1911 and 1912 at the Wallaceville Laboratory—namely, that ergot is most potent in its action during the winter months, when the process of spore-formation is proceeding in it. In these experiments (described in the *Journal* for November, 1911, and August, 1912) it was found that ergot in the commercial form as purchased from a wholesale druggist failed to produce the characteristic symptoms when fed to calves over a prolonged period. A much earlier experiment of a similar nature had given a like result. On the other hand, ergot obtained from material collected during winter from seed-cleaning machines produced positive results, a condition being set up in a calf fed with it closely resembling that now illustrated. The only difference is that in the animal experimented with the damage to the leg did not reach quite so advanced a stage, owing to the animal being slaughtered when the condition had become well established.—*The Live-stock Division.*

Rabbit-destruction.—Fields Inspector Sands, Lumsden, reports: "There is a farm at Mossburn where great difficulty has been experienced with rabbits. They would not take phosphorized pollard, and trapping results were unsatisfactory. I laid oats and molasses mixed with 2 oz. of strychnine, as directed in the Department's Bulletin No. 76, and counted over six hundred dead rabbits the following morning. There was plenty of young grass on the area poisoned."



PART OF LEG OF YOUNG BULL AFFECTED WITH ERGOTISM.
The figures are the same specimen—inverted to show different sides. (See preceding page.)

LUCERNE-GROWING.

THE MANAWATU, WANGANUI, AND TARANAKI DISTRICTS.

By J. W. DEEM, Fields Supervisor, Wanganui.

ALTHOUGH a little lucerne has been grown on this coast for very many years it is only during the past few years that the crop has become anything like general. Even as recently as five years ago it was the custom of the majority of farmers who decided to give lucerne a trial to put in a small plot of from ¼ to 1 acre. Now this is all past, and the farmer who now goes in for lucerne usually puts in an area of 3 acres and upwards; 8- and 10-acre areas are fairly common, and the writer knows of one dairy-farmer who has 50 acres.

In localities where it has been proved that lucerne can be satisfactorily grown very small areas are a mistake, for in such cases the grower does not consider he is justified in purchasing the necessary implements to give the crop proper cultivation; moreover, the cuttings from a small area are of little use to feed out green to a herd of cows, and there is not sufficient to make a stack of hay or ensilage. Under these conditions the farmer frequently comes to the conclusion that his lucerne is more trouble than it is worth.

Information supplied by the chief seedsmen between Palmerston North and New Plymouth covering the twelvemonth ended 30th June last shows that they sold 16,620 lb. of lucerne-seed during that period, which at a seeding of 15 lb. per acre represents 1,180 acres sown. This does not necessarily include the whole area sown, as no doubt quantities of seed have been procured by settlers direct from Wellington, Blenheim, and other centres. These figures go to show that the farmers are at last beginning to recognize the value of the king of fodder plants.

SELECTION OF SITE.

If one eliminates swamps, land with a hard-pan within 2 ft. or 3 ft. of the surface, and situations where the water either lies for a considerable period on the land or where the permanent water-table is within 5 ft. or 6 ft. of the surface, lucerne may be grown almost anywhere in the coastal districts now referred to. The site for preference should be land with a good free subsoil and where the permanent water-table is at least 8 ft. from the surface. The land should also be slightly undulating so as to ensure good surface drainage. Also, where possible, a field sheltered from the prevailing wind should be chosen, and with a northerly aspect for preference. The country between Hawera and Wanganui might be cited as eminently suitable for the growing of lucerne.

PREPARATION OF THE GROUND.

Having selected a suitable site, the next important work is to have it properly prepared. If the land has been in a potato crop or roots and has had plenty of cultivation so as to destroy the weeds very little trouble is experienced in preparing it for lucerne, but if the field has been neglected and is badly infested with weeds the work of preparation is heavy. In dealing with weedy land it must either be put into potatoes or some root crop such as mangolds, leaving plenty of room between the drills (not less than 30 in.), and followed by a thorough summer cleaning, or else the procedure followed which is now usual on this coast—namely, the suppression of weeds by means of a special course of cropping. One of the most favoured of these rotations is to plough in the spring, put in a heavily seeded crop of rape or kale, feed this off in the autumn, then turn the land over in April, and put in a green crop of oats or barley, or, better still, one of these cereals combined with tares. This should be fed off in August, then allowed about a month's growth, and turned under not later than the first week in October. Once the land is ploughed in the spring every effort should be made to germinate the weed-seeds contained in the upper 3 in. or 4 in. of the soil. This can be accomplished by the frequent use of a light cultivator or disk and tine harrows, but great care should be taken not to bring up any of the buried material. As a rule, if the first 3 in. is kept stirred the bulk of the weeds will be destroyed. This cultivation should be continued until it is time to sow the seed, and sowing should not be done until most of the weeds have been destroyed.

Having worked the ground well and reached the point at which it is considered to be in a condition for seeding, the land should be well rolled to produce a firm seed-bed. This is very important, and under no consideration must the rolling be slummed, because on thorough rolling greatly depends the success of the crop. One object in having the ground firm is to ensure a continuous supply of moisture from the subsoil during the hot summer months and the early stages of the crop; the other, which is really more important, is to prevent the seed being covered too deeply, 1 in. being about the most suitable depth. If the seed is covered much deeper it will take longer to get through the ground, and consequently will not be so robust, and therefore more liable to become smothered with weeds. The ideal conditions to be aimed at are to have the land firm with a fine tilth, and sufficient heat to have the seed germinated and through the ground by the fourth day. It will then come straight away and hold its own with weeds and other growths.

If a suitable area of clean lea is available for lucerne, all that is necessary is to plough it 6 in. or 7 in. deep in August, taking care that it is well turned over to cover the grass. Lime at once, and prepare by cultivation with disk and tine harrows for sowing towards the end of November.

Farmers should be strongly cautioned never to sow lucerne in a field infested with any of the couch-grasses or other bad weeds. They must be destroyed first. Couch is particularly fatal to lucerne, and should always be cleaned out before the latter is sown. Any farmer with experience knows how difficult it is to destroy couch, even when there is no crop in the land, and will realize what a proposition it

would be to clear it out of a lucerne-field without destroying the lucerne.

THE USE OF LIME.

Like all legumes, lucerne is very fond of lime; in fact, it cannot be successfully grown unless there is a fair supply of lime in the land. The average soil of this coast is rather deficient in lime, and when being prepared for lucerne it should get from 10 cwt. to 20 cwt. per acre. If possible, half of this should be applied with the previous crop and the balance worked in when preparing the seed-bed for lucerne. In most instances carbonate of lime (ground limestone) is recommended, especially when a portion of the lime can be worked in with a previous crop or on an early ploughing. But where the liming has to be done a short time before the seed is sown it is advisable to work in about 10 cwt. of carbonate of lime, then just before the final rolling apply from 3 cwt. to 5 cwt. of burnt lime. Again, if the land is inclined to be wet, or one has a considerable distance to cart the lime, the burnt form is recommended. Roughly, 10 cwt. of burnt lime is equivalent to a ton of carbonate of lime, and a considerable saving is thus made in carriage by using the former. On the other hand, burnt lime is about 25 per cent. dearer than carbonate, and the latter is much easier to handle.

MANURING.

There is some diversity of opinion as to whether lucerne should be manured or not. A few hold the opinion that by applying manure with lucerne the weeds and surface-rooting grasses are encouraged at the expense of the lucerne, which is a deep-rooting plant. Another objection raised by the non-manuring school is that the application of manure causes the lucerne to send out an abnormal number of surface roots, thus checking the growth of the tap-root. In my opinion the whole question depends on the nature of the land. If it is strong clean land, with a good subsoil containing plenty of plant-food, then probably all that is required is proper cultivation and a good dressing of lime. If, on the other hand, the soil is of a light nature and resting on a subsoil poor in plant-food—like a great deal of the Taranaki subsoil—the application of manures is beneficial. Leaving out the whys and the wherefores, the fact remains that the best stands of lucerne on this coast have had a liberal dressing of phosphatic manures, either with the previous crop or at time of sowing. Moreover, I have seen stands that had become thin and poor make a wonderful recovery after a top-dressing of manure.

Confining my remarks to the country along the west coast of the North Island from Wellington to New Plymouth, I would recommend, where possible, a liberal dressing of a good phosphatic manure with the crop previous to the lucerne, and a light dressing of about 2 cwt. at time of sowing. If, however, the preceding crop was one that was removed from the land, or if there was some reason why the land could not be manured during the previous season, from 3 cwt. to 4 cwt.—half applied three or four weeks before seeding and the remainder with the seed or at seeding-time—is recommended. Basic slag seems particularly suitable for lucerne, but basic super, Ephos phosphate, and some of the guanos give good results, and superphosphate may

be used with confidence where the land has had a liberal dressing of lime. On some lands potash appears to be beneficial, and where wood-ashes are available they should be applied at the rate of 3 cwt. to 6 cwt. per acre. As a rule nitrogen is not required, but there are instances where a dressing of nitrate of soda appeared to do good when a crop was hanging in the early stages and turning yellow.

INOCULATED SOIL.

Here we have again a great diversity of opinion, but the question is largely one of locality and condition of the land. Some of the best crops I have seen have been grown without the use of inoculated soil, but I have also seen many failures for the want of it. Some of the latter instances are quite definite, as half the field had been put in with inoculated soil and the other half without. My advice is to use inoculated soil until sure that the land will grow lucerne without it, and even then, if the soil is handy, to use it to make doubly sure. I have noticed frequently that there is no difference the first year, but in the second season the want of inoculation made itself felt. From 2 cwt. to 3 cwt. of inoculated soil per acre is sufficient. This can be taken from any field of lucerne showing plenty of nodules on the roots, the first 8 in. from the surface being the best. The soil should be broadcasted on a dull day or in the evening and immediately harrowed in, the reason being that bright sunshine is detrimental to the bacteria.

TIME OF SOWING.

Sowing must not be done until most of the weeds have been germinated and killed, and the land has had time to warm up. On this coast the most suitable time is somewhere between the middle of November and December, but in some seasons the seeding-period can be extended until the middle of January. On the light dry sandy areas it is sometimes advisable to sow about the end of October. In some seasons we get a spell of fine warm weather early in October, and the land works up well, and farmers are much tempted to sow their lucerne. This, however, is a great mistake. It is much better to wait until assured of the heat in the land being continuous. I must admit having seen a few goods stands of lucerne sown in October, but for every good stand I have seen many failures. Usually, if we get fine weather in the early part of October we have to pay for it with rough weather in November, and under such conditions lucerne sown in October will stick in November. But not so the weeds; they will flourish, and by the time the conditions are again suitable for the growth of lucerne the weeds will have possession. It cannot be too strongly emphasized that lucerne is a delicate plant when young and needs the best of treatment until established. Autumn sowing should not be attempted unless the land is in a very sheltered position and in good order, and then not later than March. As with early spring sowing, I have seen good stands where the seed was sown as late as April, but for one success there are a dozen failures. The seed germinates all right, but the growth is slow, and by the time the warm weather comes round weeds have possession.

METHOD OF SOWING.

Considerable diversity of opinion exists among the advocates of lucerne as to what is the best system of sowing—whether broadcasting, drilling through every coulter, or sowing in drills 21 in. or 28 in. apart to allow of intercultivation. All methods have been tried, but the consensus of opinion among the most successful growers on this coast is to drill through every coulter, or drill half the seed one way and the other half across. By the latter means misses are avoided, and generally an even stand follows. Next to this method broadcasting after a Cambridge roller is most in favour. While sowing in drills 21 in. or 28 in. apart is not favoured as an economic system for the ordinary farmer, there is little doubt that under certain conditions this method would give very fine results and warrant the adoption of the practice, especially where one or two good cultivations in the year would effectively control the weeds. Unfortunately, in our moist climate it would usually mean cultivating every two or three weeks for several months of the year, hence the desire to get the whole of the land covered with plants and control the weeds by smothering. Lucerne appears to like cultivation so long as the plant is not badly knocked about, and there is no doubt that when it is sown in wide-spaced drills this can be effectively carried out. I believe that a field of lucerne sown through every third or fourth coulter and carefully cultivated would last much longer than one sown broadcast, but for our ordinary farm conditions on this coast I favour the system of drilling through every coulter.

AMOUNT OF SEEDING.—VARIETIES.

This greatly depends on the preparation of the land. For instance, 6 lb. of seed carefully sown on a well-prepared seed-bed would produce a much better stand than 20 lb. on a roughly prepared field. Analysis shows that 1 lb. of lucerne-leaf produces as much food as 2 lb. of stalk. This suggests that the crop should be sown fairly thick so as to produce plenty of leaf, while thick sowing also helps in the suppression of weeds and other undesirable growths. After watching the results of some scores of lucerne areas for a number of years I have come to the conclusion that from 14 lb. to 16 lb. is about the proper seeding, with a little more if the seed-bed is rough. Stands sown with less than 12 lb. are usually coarse and produce too much stem in proportion to leaf.

There are quite a number of varieties catalogued, but when grown many of these are the same, while others are not true to name. For this coast there is nothing better than Marlborough, and if good seed of this variety can be procured the farmer need not look elsewhere. Hunter River also does well, but as a rule produces rather more fibre than Marlborough.

AFTER-TREATMENT.

Having secured a good stand of lucerne, the after-treatment is very important. Some authorities tell us that when the young plant is a few inches high it should be cut and left on the ground as a mulch. This is a great mistake, however, and is only permissible when the plants are being smothered with weeds and it is necessary to cut these weeds to prevent them smothering the lucerne and seeding themselves.

Unless considered necessary to cut for the reasons just indicated I prefer to let the crop grow until it is coming into flower before cutting it the first time. If the seed is sown in November the first cutting will be ready about the end of February, and it will greatly depend on the season whether a second cutting will be procured, but generally a second light cutting will be ready about the middle of April, and when this is removed the crop should be allowed to stand right through the winter. This is important, as the growth shelters the crowns, allows the root system to strengthen, and to some extent controls the growth of weeds and grasses. During the winter or early in the spring the leaves will probably turn brown and drop off. This does not matter, and has no detrimental effect on the lucerne.

As the weather warms up about September a new growth will be seen coming away from the crowns, and when this growth is about 2 in. high and fairly persistent over the field the stalks that have been standing during winter may be removed with the mowing-machine. Care should be taken not to cut too low, leaving if possible from 3 in. to 4 in. of stubble. The new growth should be allowed to come away, and should be ready to cut between the middle and the end of November. This cut will probably be infested with weeds, such as sow-thistle, and is better put into ensilage or carted out to feed green to stock. At this stage care should be taken to remove the lucerne before the weed-seeds have ripened. If a cut is taken off about the end of November, as suggested, another will be ready early in the New Year, and it is after this and the subsequent cuts, during the dry weather, that cultivation should take place, this being the best time to destroy weeds.

Cultivation can be accomplished by the use of tine harrows and, if necessary, a light spring-tooth cultivator, or, what is probably better, a rotary lucerne-cultivator, of which there are several makes. I entirely disagree with those who advocate cultivating lucerne with a disk harrow or heavy cultivator until one thinks it is killed, then giving it another stroke to make sure; or with the suggestion that if lucerne is not doing well it should be lightly ploughed. Any one with experience will readily realize that if lucerne is heavily disked or ploughed the operation must cut a great many of the plants, which ultimately die, and it is only necessary to heavily disk a paddock a few times to get the stand so thin that it is not worth preserving as a lucerne-field. Doubtless when a field has become very dirty with weeds and grass, and the lucerne is exhibiting a tendency to choke out, a well-regulated disking, while destroying some of the plants, will put new vigour into the remainder. In thus using the implement see that the disks are kept straight; if this is done a few crowns will be split, but there will be less cut out. Before leaving this question let me repeat that where lucerne is sown broadcast or in drills the cultivation should be only of such a nature that it will destroy surface weeds and keep the surface of the land from becoming too hard. Cultivation should never be attempted in winter or when the land is wet, as under such conditions weeds are encouraged rather than destroyed.

SUMMER AND AUTUMN FEED.

As a green fodder (soiling-crop) for feeding dairy cows from January to March lucerne is unsurpassed. Where properly established it does

away with all the worry of growing soft turnips, maize, &c., and in addition to providing the necessary green feed it provides a cutting for hay and some grazing. As an example I may mention the case of Mr. Metcalf, of Alton, some twelve miles south of Hawera, who is dairy-farming on 60 acres, 11 acres of which is in lucerne. Last season, after taking a heavy cutting for hay, he fed his herd of forty cows, thirty calves, and the farm horses on lucerne right through the autumn, and they had more than they could consume. When at Mr. Metcalf's place last February he put the position in a nutshell by saying, "I am at present feeding all my stock on lucerne; my cows are keeping up their milk, my young stock are doing well, and my pastures are resting instead of being rooted out by a lot of hungry cows." There is nothing to prevent a very large number of the dairy-farmers on this coast following Mr. Metcalf's example. To provide hay and green feed for a dairy herd a minimum of one acre of lucerne for every six cows should be allowed.

GRAZING.

To get the best out of lucerne and keep the stand in first-class order it should not be grazed, but in many cases the farmer is unable to cut it and has to resort to grazing. Others prefer to cut once or twice and graze during the rest of the year, and where this is carefully carried out there is not so much harm done. I am opposed to grazing at all the first season. This is the time when the stand is being established and requires the best of care, and there is no doubt that grazing at this period checks the growth of the lucerne and promotes the growth of weeds. After the first season judicious grazing may be indulged in, firstly in spring to clean up the rough growth that has been standing over winter, and again in autumn when the growths have become so short as not to be worth cutting, always taking care not to graze the field too close, especially when going into winter. Nothing is more likely to ruin the lucerne than eating it down bare in winter when its growth is at a standstill. If this is done the conditions are ideal for the growth of weeds, and by the time spring arrives they will have taken possession. Another thing to be carefully avoided is grazing a lucerne-field when it is wet and the surface likely to puddle. In such case it is very hard to get the surface worked loose again without unduly knocking the lucerne about. A great objection to summer grazing is the weed and grass-seed factor. If stock that have been eating weeds and grasses with ripe seed have access to lucerne it will not be long before the lucerne-field is full of these weeds and grasses.

PRECAUTIONS IN FEEDING OUT AND GRAZING.

When lucerne is given green to stock it should be fed sparingly for the first day or two, and never in a wet condition, otherwise there is a danger of it causing hoven, especially in dairy cows. When it is intended to graze lucerne, stock should not be put on until late in the day, when any dew or other moisture has had time to dry, and for the first few times stock should go on with full stomachs. Dry stock put on lucerne for an hour a day for a couple of days may then be left on indefinitely—in fact, if the weather is dry they may be left on from the first day. Not so dairy cows—they require great care, and should only be put on for twenty minutes to half an hour for the first two or three

days; after this the time may be extended to one or two hours. No matter how careful one is there is always danger with individual cows, as some appear much more prone to hoven than others. For this reason dairy cows pasturing on lucerne should be carefully watched until one is sure that none are animals easily affected. The best and safest proposition, however, is to cut the lucerne and feed it out to the cows.

MAKING HAY.

Lucerne makes the best of hay if properly saved. The leaf is the most valuable part, and for this reason every endeavour should be made to preserve the leaves, which are very liable to break off if dried too quickly or given too much exposure to the weather. It is good practice not to cut more lucerne at a time than can be quickly dealt with. The crop should not be left to scorch in the swath, but after partial drying should be gradually cured in cocks. Care must also be taken to see that it is in good condition before being stacked, otherwise it is inclined to heat, and the hay will be inferior.

The correct time to cut lucerne to make good hay or for feeding out green is just when the new growth is starting out from the crowns, usually just as the flowers begin to open. If left till later there is a danger of the leaves falling off when the crop is being saved for hay, and the plant becomes more fibrous and therefore more difficult to digest.

STANDS RUNNING OUT.

After a few years, particularly where the field has been neglected or has had too vigorous cultivation with the disk harrows and similar implements, the lucerne will get thin, and the farmer may be in a quandary as to whether it will pay him to keep it going for another season or break it up. If a paddock having reached this stage is given a good disking early in April, and surface-sown with prairie-grass or prairie and Italian rye-grass, it will become one of the best paddocks on the farm for another two or three years. A good demonstration of the use of rye-grass for this purpose is to be seen in one or two of the fields at the Moumahaki Experimental Farm.

DISEASES.

The main diseases affecting lucerne on this coast are rhizoctonia and leaf-spot. Rhizoctonia is a root-fungus mostly found on land that has previously been in bush, and is most prevalent in the vicinity of stumps. If only small patches are affected they should be dug over and dressed with sulphate of iron at the rate of 4 cwt per acre, or with burnt lime at the rate of 2 tons per acre. Great care should be taken not to spread the fungus by means of the harrows or cultivator. Unfortunately, the fungus is more or less spread over most affected fields before it is noticed. In such cases treatment must be applied to the whole paddock, and from 1 to 2 tons of burnt lime per acre is recommended. The fungus is easily recognized: the plant turns yellow and dies. If examined any time after the plant has gone yellow it will be found that the root is covered with a whitish fungus. Leaf-spot comes in the form of small round brownish spots on the leaves. It makes its appearance at any time of the year, but is most frequent in winter and spring. Generally speaking, any condition which is unfavourable for the growth of the lucerne is favourable for the development of leaf-

spot. The disease does not appear to do much harm except to the immediate crop. If a crop is badly affected all that is necessary is to cut it, and a new clean growth will come away.

CONCLUSION.

In conclusion, I would strongly urge every farmer who has land at all suitable to grow lucerne. He should remember that even if it only lasts a few years the increased fertility of the land will alone pay him for all his trouble. Apart from the marked nitrifying properties of lucerne, the decaying roots add humus to the soil. The action of the extensive root-system also greatly improves the land mechanically, opening up the subsoil and giving better drainage. After a field has been in lucerne for a few years it is estimated that the fertilizing-value of the roots and stubble turned under is anything from £4 to £6 per acre.

CONTROL OF CAPE DAISY.

CAPE DAISY or Capeweed (*Cryptostemma calendulaceum*) has recently been declared a noxious weed by the counties of Wanganui, Waitotara, and Patea. There is not a great deal of the weed on the farm lands in these counties, it being chiefly confined to accommodation paddocks and roadsides. On the other hand, it is very bad in the boroughs of Wanganui and Patea and in the Town District of Waverley, but none of these three local bodies have declared it a weed. Cape daisy is especially fond of broken land where the sole of grass is poor and the surface gets broken with stock tramping, but does not seem to make much headway on lands holding good pasture. Dressings of any of the poisonous weed-destroyers will kill it, but probably the cheapest and most effective way to deal with it is to cut it just under the surface with a sharp implement. I have found a sharp narrow hoe very effective. In chipping the weed every care should be taken to preserve the sole of the grass as much as possible. Discussing Cape daisy recently with the Mayor of Patea, he stated that there was frequently very little showing in a street until the surfacemen were put on to clean up the sides and remove the grass, after which in a few weeks there was a solid growth of the weed. As mentioned, there is not a great deal of Cape daisy on the country lands, and with a little care it should be possible to control it. At time of writing (October) the plant is in full bloom.—*J. W. Deem, Fields Supervisor, Wanganui.*

Apiary Training at Ruakura.—A record number of persons are receiving training at the apiary section of the Ruakura Farm of Instruction this season. It was found impossible to handle the class in the honey-house, and a marquee has been provided both as a workroom and lecture-room.

Corriedale sheep appear to be selling well in America. A recent number of the *National Wool-grower* illustrates a bunch of Corriedale rams sold at the last Salt Lake sale at £40 per head, and another ram pictured realized £131 The flocks from which these sheep came are of New Zealand origin.

CERTIFICATE-OF-RECORD TESTING.

SOME OUTSTANDING COWS IN THE CURRENT LIST.

By W. M. SINGLETON, Assistant Director of the Dairy Division.

IN the comparatively long list of C.O.R. cows appended hereto, covering the certificates issued from 1st August to 31st October, will be found quite a number of records of more than average merit. The writer would like to comment on many of these, but of necessity must confine his remarks to only a few.

BURKEYJE SYLVIA POSCH.

Burkeyje Sylvia Posch, a Friesian imported from Canada, has completed her fourth test with the splendid record given below. She is again on test, and has been under our supervision each year since she first calved. Her several years' work are indicated by the following figures :—

Test.	Age at Start of Test.	Days in Milk.	Yield of Milk.	Fat.	Standard, Fat.
	Years Days.		lb.	lb.	lb.
First	1 350	365	16,646·3	505·27	240·5
Second	3 30	365	19,024·7	610·42	280·0
Third	4 69	365	20,016·7	679·86	320·4
Fourth	5 113	365	20,947·3	731·57	350·0

After finishing her fourth season Burkeyje Sylvia Posch dropped twin heifer calves that she had been carrying some eight months of her 365-day milking-period. This enhances the value of her work very materially, since she has in four years and five months produced six calves with equal division of sex. The total of 76,635 lb. milk and 2,527·12 lb. fat indicated in the foregoing records does not, however, tell the whole story of her yield of milk and butter-fat. Her owners, Messrs. H. North and Sons, advise us that this cow has never been dry since she commenced her first test. The yields of the four periods between the 365th day of her testing-periods and the date of calving subsequent to test have not been included. During this interval after the last test her daily yield did not get lower than 22 lb. milk per day, and increased to 50 lb. per day prior to calving. Since then she has got into her working-pace, and our testing officer has weighed her milk at 103·2 lb. in one day with three milkings. Her credit to end of October is 76 days, 7,191·8 lb. milk, and 259·22 lb. fat, which for that number of days exceeds the corresponding production of our present champion, Westmere Princess Pietertje.

Burkeyje Sylvia Posch is by the same sire as May Echo Sylvia, the Canadian cow that holds the world's record for milk for the short-period tests, she having produced over 150 lb. milk in twenty-four hours. May Echo Sylvia is the dam of the young bull King Sylvia

that sold recently at public auction for $106,000, or £21,766. This price is double the next-highest figure yet brought by a Friesian bull, and we consider that the work of our New Zealand cow increases the esteem in which the young bull named should be held.

The feeding of Burkeyje Sylvia Posch makes her work even more attractive. The owners advise that during the summer months she depastured on grass and got some bran at milking-times. Later in the season was added to this some pulped roots and oat-sheaf. Surely few records of such excellence have been made under conditions so closely approximating what may be found on many dairy farms.

COLANTHA'S PONTIAC RAG APPLE.

This cow is a daughter of Dutchland Colantha Mercedes, and was born some time after her dam's arrival in New Zealand from the United States of America. She is a cow that does credit to her breeding, which represents some of the most popular strains in the Unites States to-day. Her dam is Mr. Aitchison's 750-lb.-butter-fat cow, and but for one or two serious disabilities the daughter's record would have exceeded the 700 mark by a respectable margin. Owing to an accident prior to calving she dropped a dead calf, which was certainly a drawback from the viewpoint of high record. During the early portion of her season the Clutha River overflowed its banks and destroyed a considerable portion of feed on the place that should have been available for her, this proving a further hindrance to highest production.

Her sire is a full brother to Pontiac Clothilde de Kol II, a one-time world's-record cow with a credit of 25,318 lb. milk and 1,017·28 lb. fat. The sire's sire is none other than the renowned Pontiac Korndyke, who has created quite a sensation through the short-period records of his daughters. Colantha Pontiac Rag Apple's paternal grandam is a daughter of Hengerveld de Kol, a bull proved by his progeny as one of great ability to transmit dairy factors.

Colantha's Pontiac Rag Apple's dam is a good daughter of Colantha Johanna Lad. He is a son of Colantha IV's Johanna, a cow that held the world's year and other records prior to giving place to Pontiac Clothilde de Kol II. The dam of Dutchland Colantha Mercedes is a daughter of Pietertje Hengerveld Count de Kol—a good grandson of de Kol II.

With her good physical development and her splendid dairy inheritance Colantha's Pontiac Rag Apple should give a good account of herself on test under favourable conditions for feed and care.

LADY PAULINE.

The Friesian cow Lady Pauline holds the distinction of being the only new class-leader appearing in the present list of records. Her yield of 18,137·1 lb. milk and 603·85 lb. fat, produced in 365 days, and commencing at the age of 2 years 168 days, places her as leader of the junior two-year-old class for her breed, from which she displaces Mr. McLachlan's Friesland Park Butter Girl, who has a record of 13,966 lb. milk and 553·21 lb. fat.

Bred and tested on the high country around Dannevirke, Lady Pauline's record reflects great credit on her owner, Mr. James Hart.

Provided feed can be grown or procured, good records can be made under conditions which would at first suggest that a high record was out of the question. A cow of good breeding will usually respond well at the bucket to good care and intelligent feeding.

Lady Pauline is sired by a son of Cliffside Laddie. The latter has fifteen C.O.R. daughters, some of which have the following records: A senior four-year-old with 665·14 lb. fat; a senior three-year-old with 615·85 lb. fat; a mature cow with 543·86 lb. fat; and a senior two-year-old with 597·28 lb. fat. Lady Pauline's dam is Johanna Fayne Lady, which has a certificate of record for 15,936·6 lb. milk, containing 532·38 lb. fat, in the four-year-old class. This production was made in 347 days.

A full sister of Lady Pauline is Lady Fayne, who was tested at Mr. Hart's, and has a record for 498·66 lb. fat from 14,667·1 lb. milk, at the age of 2 years 243 days. Johanna Fayne Lady and her two daughters have three fine records which should assist in popularizing this strain.

WOODSTOCK'S FANCY FREE.

A record of outstanding merit published in the list is that of Woodstock's Fancy Free, owned and tested by Mrs. A. Banks and Son, of Kiwitea. Six-hundred-pound two-year-old butter-fat records are uncommon, and this heifer's sire now claims two daughters with that distinction. The sire, Fancy's Lord Twylish, was imported from Australia, and besides having sired Mere, our world's champion Jersey yearling, he has sired Woodstock's Fancy Free, and also Woodstock's Baby, with a record, started at 1 year 335 days, of 514·04 lb. butter-fat.

The dam of Woodstock's Fancy Free is a daughter of Eminent's Fontaine, with a record of 304·47 lb. fat in 332 days, commencing at 2 years 46 days of age. Eminent's Fontaine has left his influence for good on the production of New Zealand Jerseys. He has eighteen C.O.R. daughters, six of which have exceeded 500 lb. butter-fat. These include Waipiko Myrtle, with 562·49 lb. fat as a two-year-old; Eminent's Maggie, with 572·13 lb. fat as a two-year-old; Eminent's Sherry, with 554·10 lb. fat as a three-year-old; and Eminent's Girl, with 515 lb. fat as a three-year-old.

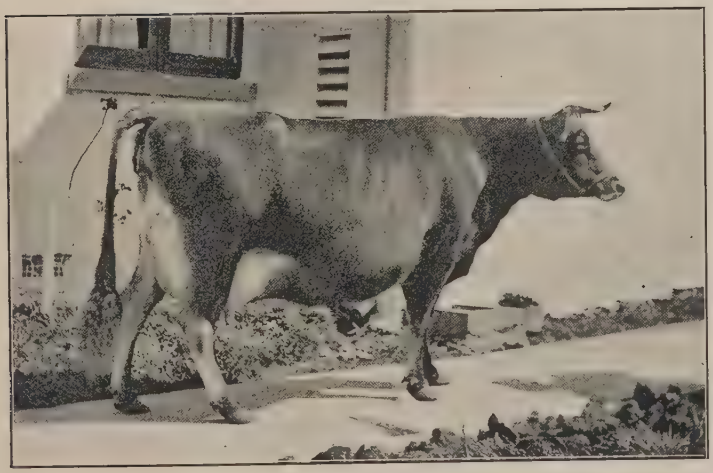
Although Woodstock's Fancy Free inherits production, her yield on the high country at Kiwitea speaks well for her feeding and care, which have evidently left little to be desired.

MAJESTY'S EILEEN.

Majesty's Eileen, a Jersey cow owned and tested by Mr. H. Salway, of Bell Block, has finished with a creditable record exceeding 600 lb. of butter-fat. This cow has had a successful show-ring record, and has evidenced great capacity to convert food into milk. She was on test as a two-year-old, when during a dry season she produced 351·82 lb. fat.

On breeding she should be a producer. She is a daughter of Majesty's Fox, who has undoubtedly proved himself one of our best transmitting Jersey sires. We have issued certificates on the production of twenty-three of his daughters, most of which have been tested before they reached the mature class. These include a 528-lb.-butter-fat two-year-old, a 542 lb. three-year-old, a 534 lb. four-year-old, while Majesty's Eileen now gives this bull a 606-lb.-butter-fat daughter.

LADY PAULINE.



MAJESTY'S EILEEN.

The dam of Majesty's Eileen is a daughter of K.C.B., a bull with twenty-one C.O.R. daughters, which include a 650 lb. three-year-old, a 626 lb. three-year-old, and three mature-class records of 600 lb., 547 lb., and 514 lb. butter-fat respectively. Majesty's Eileen evidently shows a good "nick" of the Majesty's Fox and K.C.B. strains, both of which certainly represent good production. Given breeding such as this, with good care and attention during test, a cow should scarcely fail to do well. Majesty's Eileen has certainly measured up to expectations.

CERTIFICATES ISSUED FROM 1ST AUGUST TO 31ST OCTOBER, 1918.

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	FRIESIANS.					
		Yrs. dys.	lb.		lb.	lb.
Junior Two-year-old.						
Lady Pauline ..	James Hart, Raumati	2 168	257·3	365	18,137·1	613·85
Oakwood Gipsy Queen	W. D. Hunt, Invercargill	1 318	240·5	365	13,037·4	484·89
Monavale Princess Paxton	C. C. Buckland, Monavale	2 14	241·9	365	12,373·6	449·03
Lakeside Rasel Queen	J. W. J. Gardiner, Lowgarth	2 41	244·6	332	10,316·3	411·89
Quickshine ..	H. E. Johnson, Tokaora	2 0	240·5	365	9,563·3	344·45
Lowgarth Queen Wild Rose	J. W. J. Gardiner, Lowgarth	1 352	240·5	350	10,268·6	338·34
Lakeside Beauty Canary	J. W. J. Gardiner, Lowgarth	2 77	248·2	307	9,194·1	334·52
Edinglassie Buttercup	H. E. Johnson, Tokaora	1 235	240·5	365	8,525·7	303·12
Senior Two-year-old.						
Monavale Friesian Regina	C. C. Buckland, Cambridge	2 213	261·8	365	12,870·5	469·81
Monavale Florence Paxton	C. C. Buckland, Cambridge	2 221	262·6	365	8,839·8	401·14
Belle of Holland ..	W. James, Bell Block	2 293	269·8	277	7,647·4	298·07
Lady Louisa ..	L. R. McKelvie, Bull's	2 349	275·4	313	6,724·5	283·05
Senior Three-year-old.						
Cluny Colantha Pontiac	Cluny Friesian Farm Company, Wellington	3 303	307·3	336	14,534·5	462·73
Alcartra Pietje Pride I	William James, Bell Block	3 352	312·2	325	9,003·5	343·54
Junior Four-year-old.						
Monavale Korenbloem	C. C. Buckland, Cambridge	4 158	329·3	365	12,294·5	507·07
Senior Four-year-old.						
Cluny Princess Edinglassie Friendly	Cluny Friesian Farm Company, Wellington	4 188	332·3	365	9,763·2	347·72
Mature.						
Burkeyje Sylvia Posch	H. North and Sons, Omimi	5 113	350·0	365	20,947·3	731·57
Colantha's Pontiac Rag Apple	George Aitchison, Kaitangata	5 121	350·0	365	18,086·5	693·92
Dutchland Queen ..	A. S. Elworthy, Timaru	7 9	350·0	365	16,067·1	610·09
Daisy Verbelle Hengerveld	C. C. Buckland, Cambridge	7 151	350·0	365	17,262·1	541·46
Clematis	C. Mayhead, Midhirst	5 13	350·0	348	9,193·4	358·00
Trixy	E. C. Banks, Matamata	*	350·0	275	10,582·9	352·15

* Mature.

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat reqd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS.					
Junior Two-year-old.		Yrs.dys.	lb.		lb.	lb.
Woodstock's Fancy Free	Mrs. A. Banks and Son, Kiwitea	2 0	240·5	365	12,134·8	630·15
Laurel's Orange Rosebud	F. Cresswell, Ballance	2 15	242·0	365	8,815·3	531·88
Miro Meadows Maire	R. W. Southee, Colyton	1 308	240·5	365	7,086·5	441·64
Poi	F. S. McRae, Palmerston N.	1 357	240·5	365	8,316·1	437·74
Lovely Deem ..	Chilcott and Webby, Frankton Junction	1 328	240·5	365	8,487·2	413·53
Meadowvale Sunflower	E. O'Sullivan and Sons, Cardiff	1 307	240·5	322	7,203·9	412·18
Record of Bull's ..	F. J. Watson, Bull's	2 33	243·8	365	6,464·6	394·39
Miro Meadows Maud	A. A. Ward, Miro ..	2 56	246·1	324	6,426·0	364·55
Waipuna's Fancy ..	H. C. Wallace, Tamahere	2 60	246·5	316	5,975·1	361·30
Middlewood's Mary..	Mrs. A. Banks and Son, Kiwitea	1 361	240·5	365	8,304·7	357·33
Camellia of Jersey Meadows	H. H. Phillips, Te Rehunga	1 338	240·5	365	5,514·6	348·63
Woodstock's Eminence	Mrs. A. Banks and Son, Kiwitea	1 193	240·5	365	6,218·9	345·56
Miniature	Stanley W. Shaw, New Plymouth	1 345	240·5	336	6,174·6	342·65
Laurel's Bright Hope	F. Cresswell, Ballance	1 359	240·5	365	5,132·1	340·77
Belvedere Thistledown	E. Eagle, jun., Belvedere	2 8	241·3	309	5,106·4	336·13
Korokoro Judy ..	R. W. Southee, Colyton	1 356	240·5	365	6,923·5	335·34
Laurel's Gipsy Gem	F. Cresswell, Ballance	2 27	243·2	322	7,236·8	329·63
Miro Meadows Madge	Heber Wells, Onaero	2 7	241·2	349	5,532·7	317·22
Belle of Swarthmoor	S. Jones, Gisborne ..	1 330	240·5	308	6,241·4	312·08
Belvedere Briar-berry	E. Eagle, jun., Belvedere	2 35	244·0	342	5,030·1	301·25
Sweet of Jersey Meadows	H. H. Phillips, Te Rehunga	1 258	240·5	365	5,613·9	284·31
Enchanter.. ..	A. Buchanan, Palmerston N.	1 220	240·5	285	5,104·7	281·52
Honey Sweet ..	T. Church, Te Rapa..	1 305	240·5	346	4,203·8	284·83
Senior Two-year-old.						
Beauty's Abbess ..	John Guy, Kaponga..	2 353	275·8	365	10,276·0	572·22
Moana	J. A. McCrea, Palmerston N.	2 302	270·7	362	9,212·7	528·87
Fawn Beauty ..	F. E. Day, Tamahere	2 357	276·2	365	7,738·4	477·85
Tiki Hou	F. S. McRae, Palmerston N.	2 324	272·9	365	7,332·6	417·35
Miss Sirdar's Beauty	D. Dodunski, Inglewood	2 208	261·3	351	6,571·8	408·72
Country Beauty ..	Curtis's Estate, Inglewood	2 247	265·2	325	5,392·5	340·64
Paori's Banksia ..	E. Fitton, Waihou ..	2 293	269·8	340	6,063·7	300·09
Miro Meadows Rose	Heber Wells, Onaero	2 358	276·3	296	5,102·9	295·84
Three-year-old.						
Jenny's Princess Maid	D. P. F. Malone, Riverlea	3 335	310·5	305	6,953·5	442·64
Dominion Princess ..	Ruakura Farm of Instruction, Hamilton	3 335	310·5	365	7,205·6	440·94

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued.*					
		Yrs.dys.	lb.		lb.	lb.
Three-year-old—contd.						
Piaku Queen ..	S. Jones, Gisborne ..	3 352	312·2	365	6,999·0	413·56
Springfield Sylvie ..	C. H. Thompson, Hastings	3 241	301·1	365	6,205·2	402·48
Silver Bell.. ..	C. A. Care, Cambridge	3 6	277·6	326	7,617·0	402·10
Lady Malaprop of Willowbank	Ranford Bros., Stratford	3 20	279·0	316	7,135·5	375·26
Princess Olga ..	E. O'Sullivan and Sons, Cardiff	3 43	281·3	311	6,688·0	369·31
Dominion Sweetheart	Ruakura Farm of Instruction, Hamilton	3 11	278·1	365	5,984·8	324·43
Four-year-old.						
Holly Bloom ..	H. L. Spence, New Plymouth	4 338	347·3	365	7,981·5	472·20
Gem's Glory ..	T. Pollock, Pukekohe	4 304	343·9	360	8,365·6	463·61
Tom's Countess ..	Estate of H. B. Curtis (decd.), Inglewood	4 349	348·2	358	7,587·7	453·31
Lady Ruth ..	F. E. Day, Tamahere	4 360	349·5	365	8,427·5	432·53
Molly Bawn ..	T. Church, Te Rapa..	4 81	321·6	327	8,107·6	394·39
Dreamland ..	Wren Bros., Tokaora	4 353	348·8	323	7,929·1	392·22
Quality of Willowbank	Ranford Bros., Stratford	4 138	327·3	313	6,102·6	365·48
Mature.						
Majesty's Eileen ..	H. Salway, Bell Block	6 231	350·0	365	10,920·8	606·93
Fox's Princess ..	S. E. Worboys, Woodville	5 326	350·0	346	7,743·4	534·45
Susy Gamboge ..	O'Sullivan and Sons, Cardiff	6 133	350·0	354	9,442·4	533·66
Twylish Beauty ..	F. E. Day, Tamahere	5 304	350·0	365	9,553·3	532·01
Primrose of Jersey Holme	S. R. Lancaster ..	6 310	350·0	348	9,967·3	478·56
Pearl's Blue-bell ..	S. J. Bennett, Kaupokonui	6 261	350·0	340	8,852·4	465·33
Brown Twylish ..	F. E. Day, Tamahere	5 304	350·0	365	8,948·7	459·81
Dainty Carnation ..	W. H. Tippins, Norfolk Road, Inglewood	7 304	350·0	326	8,667·5	446·85
Zea	F. J. Watson, Bull's	6 268	350·0	365	6,506·2	441·60
St. Clair Olinda II ..	J. G. Harkness, Wellington	5 232	350·0	353	9,078·3	440·61
Sunflower XII ..	H. H. Phillips, Te Rehunga	9 60	350·0	303	8,230·6	434·34
Fox's Pet II ..	S. Jones, Gisborne ..	5 361	350·0	365	7,646·3	415·51
Fox's Champ ..	H. H. Phillips, Te Rehunga	6 234	350·0	330	5,728·7	382·24
Golden Stream ..	Ranford Bros., Stratford	7 8	350·0	310	7,505·8	380·51
Woodside Pet ..	Ranford Bros., Stratford	8 350	350·0	348	6,825·1	365·92
	MILKING SHORTHORNS.					
Two-year-old.						
Dominion Lottie of Ruakura	Ruakura Farm of Instruction, Hamilton	2 334	273·9	324	8,474·1	313·29
Three-year-old.						
Snow	R. Turnbull and Son, Sentry Hill	3 335	310·5	344	9,965·2	371·94

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	MILKING SHORTHORNS—*continued.*					
Four-year-old.		Yrs. dys.	lb.		lb.	lb.
Lowland's Countess	J. C. Hearsey, Longburn	4 345	348·0	322	11,755·2	421·57
Violet	R. Turnbull and Son, Sentry Hill	4 309	344·4	329	9,037·4	362·09
Mature.						
Willowbank Beauty	S. G. Morgan, Ngawapurua	*	350·0	365	15,725·8	655·22
Waimea Rose ..	R. V. Brown, Weraroa	*	350·0	355	11,466·2	500·34
Willowbank Strawberry	S. G. Morgan, Ngawapurua	*	350·0	354	11,448·5	486·23
Waimea Zephyr ..	R. V. Brown, Weraroa	*	350·0	276	9,454·2	426·72
Pukepai Snowy ..	C. I. Harkness, Weraroa	8 201	350·0	362	11,410·8	411·21
Corriblea Duchess ..	Martin Creaven, Taikorea	*	350·0	365	10,132·6	387·43
Dominion Roany of Ruakura	Ruakura Farm of Instruction, Hamilton	*	350·0	365	9,039·7	378·28
Ryedale Dot II ..	Ruakura Farm of Instruction, Hamilton	7 316	350·0	365	9,188·6	373·66
	AYRSHIRES.					
Mature.						
Sprightly III of Haydowns	C. B. Morgan, Ngawapurua	6 271	350·0	334	9,382·4	459·64

* Mature.

WOODSTOCK'S FANCY FREE.

POULTRY STANDARDS.

THE IDEAL LAYING AND BREEDING TYPE.

By F. C. BROWN, Chief Poultry Instructor.

PRIOR to the initiation of egg-laying competitions in the Dominion, fourteen years ago, high-type laying-stock were practically unknown in the poultry world here. At that time the noted breeders of purebred poultry chiefly concerned themselves with the production of birds possessing special show-points, while, generally speaking, egg-laying qualities were ignored—in fact, from an egg-laying point of view the common barn-door fowl was generally looked upon as a better layer than the prize-show specimen. Notwithstanding this, the fanciers of old performed a monumental work in manufacturing and bringing to the high standard of perfection the various beautiful birds which were available at that time. Indeed, it was the fancier, by producing and preserving breed-type, who laid the foundation of the heavy-laying stock existing in the Dominion to-day.

Probably the greatest mistake made by the fancier in carrying out his special work was the false interpretation he placed on the English Poultry Club's standards. Had Ludlow's plates, which were first published in 1902 in that great work, Lewis Wright's "Book of Poultry," been taken as an ideal to aim for, beauty and egg-laying capacity would have been more happily combined. As it was, the bird mostly sought was one with extreme show-points, such as excessive comb, wattles, loose feathering, long legs, &c. With the advent of egg-laying tests and the general appreciation of heavy-producing stock it was soon recognized that the then show-bird and the leading birds in the egg-laying tests were two distinct types. As a natural result of this awakening a revolution took place. Instead of the prize-winning bird in a fancy show-pen being sought for it was the bird possessing an egg-record performance.

It was only to be expected that under this new order of things weaknesses would creep in. This was made most manifest by a large section of utility breeders ignoring breed-type, desired size, &c., and considering laying-capacity as everything. Even in the egg-laying tests birds were allowed to compete which were diminutive types of their breed, and which in no way conformed to the standard requirements of the breed they were entered under. The same weakness exists to-day, but fortunately to a lesser extent, for there is at the present time a healthy opinion being created in regard to the ideal type of bird to aim at. The tendency to consider that the heavy layer must necessarily be a small or weak specimen of its breed is being severely checked. In this connection the introduction of utility classes into our poultry shows has served a good purpose, as the ideal bird now sought is one pure in every sense of the word without being of exaggerated type of the breed it represents. In short, there must be a happy

combination of standard requirements, with points indicative of laying-power, not the least important of which are constitutional features.

In this connection it is most gratifying to know that the Christchurch Utility Poultry Club has decided that in its fifteenth egg-laying test which commences next April any bird entered which is not a fair specimen of its breed will be rejected. Among serious breed-defects which will disqualify from competition are the following: Side spikes or sprigs on comb; in the case of light breeds, more than one-third red in ear-lobes, or heavy breeds more than one-third white in ear-lobes; wry tails; roach backs; and legs or plumage other than the colour specified in the English standards of the respective breeds. All lovers of purebred poultry, and especially those who realize the importance of preserving in a state of purity the useful breeds, will view this important step with great satisfaction. Judging by many of the birds which have taken a leading part in competitions in this country, and also outside of it, other organizations might follow with advantage the example of Christchurch.

In past years there has been much rivalry between the fanciers and the utilitarians, each section practically accusing the other of spoiling breeds of poultry. As a result, however, of the study that has more recently been given to the question of egg-yielding power, and a more common recognition of the necessity of having nothing but really purebred birds in the utility classes at our shows, together with the adoption of a saner standard of judging, there is now a better understanding as to the ideal utility bird to aim for. In view of these factors, and the rapid strides being made in the numbers as well as the quality of the birds to be seen in the utility classes at our shows, any remaining differences which exist between the fancier and the utility breeder should soon be cleared away. Then both parties will probably agree that there is really nothing to prevent any of the useful breeds of purebred poultry being judged by one standard of excellence, under which beauty or breed-points is combined with usefulness.

Of course, there will always be some breeders, both of utility and fancy stock, who will ridicule the idea that this happy mean can be attained. They may be right, but only so far as the stock they fancy is concerned. True, there may be some confusion and difficulty in judging parti-coloured breeds, as it is usually expected that the best-marked birds must win; whereas in awarding under the new order of things—when type, utility-characters, and constitutional vigour are of such vital importance—the best-feathered bird may have to be discarded. In the case, however, of self-coloured breeds (black or white) there is no sound argument in favour of having two standards for judging any one breed, for it goes without saying that if the one class of bird is right the other must necessarily be wrong when both stand for the one object—namely, productive capacity and the preserving of breed-type.

It is gratifying to know that while many mistakes have been made in breeding poultry there are men who treat this branch of their business as a serious proposition, to be mastered and conducted on the same strict principles as in the breeding of any other class of live-stock. These men realize that the main consideration is the securing of the right breeding-birds, and they aim at combining individual

performance with constitutional utility and breed-points. A common experience I have had in laying down these principles to individual breeders, when judging at shows, is to have weak and even crossbred types pointed out to me as the birds that should have won, merely because they possessed a high trap-nest or single-pen record. This is a weak reason, the adoption of which has already had the effect of reducing the value of many good strains by bringing about deterioration of breed-type, and decreasing the size of the birds as well as of the eggs they produce. I do not mean in any way to decry individual single-pen or trap-nest records, but to emphasize that if success is to be permanently attained we must consider something more than performance, for high production can be attained at too great a cost.

True, a hen's first mission is to lay eggs and as many of them as possible, but of what avail is it to have a freak type of bird that will produce a high egg-yield when there is no guarantee that its descendants will lay heavily or be other than all shapes and sizes? In the breeding of live-stock the world over it is an accepted principle that only the type which has been bred true to a given ideal from generation to generation has the power to transmit desirable characters. Therefore in a utility class of poultry, when egg-producing power is the chief consideration, how is any one to judge the quality with a view to advancing the breed unless there is a laying-type and an ideal to aim at? The poultry exhibited should be like the exhibit of all other agricultural stock in which the possession of breed-points is imperative, but this must be accompanied by constitutional and useful characters.

A SPECIMEN OF THE IDEAL TYPE.

I have long since advocated a certain type of bird which I consider the correct type of the heavy layer and a desirable breeding-bird. The White Leghorn pullet here depicted conforms to my ideal of the female of that breed, and this was the type aimed at by the Department when making its modification of the English standards for judging utility poultry. The object of this revised standard is to furnish some guide whereby extreme fancy points can be cut, and the breeding thus encouraged of birds which, while true to the type of their respective breeds, yet possess the necessary utility characters. These characters were largely possessed by the earlier types of the breeds, as indicated by Ludlow's plates, but were lost to a great extent by a false interpretation of the English standards by judges through their desire to secure extreme show points.

In the first place, this bird is a good specimen of her breed, and is therefore beautiful to look at; secondly, she has the necessary "timber," so desirable in a breeding-bird; while, thirdly, she possesses the desirable points indicative of egg-laying capacity and constitutional vigour. These are made manifest by a clean face free from wrinkles, a bold eye, tight feathering, shanks short and bone flat, set wide apart, well-developed crop, wide across the saddle, and a deep full abdomen (which should be soft to the touch). With proper development in these parts of the bird's anatomy it is necessary that the keel be short and that the legs stand wide apart. The skin surrounding the abdomen must be soft and of fine texture to allow for the necessary expansion and contraction which takes place in the laying and non-laying seasons.

A well-developed crop is imperative, for it is obvious that a heavy-laying bird must have the feeding and digestive power to convert a large amount of food in maintaining strong bodily vigour and producing her special egg-yield. The special crop and abdominal development combine to give the bird a relatively spare appearance surrounding the breast-bone, which is in contradistinction to the desired full-breast development of the table bird. The heavy-laying bird must have a strong active appearance, for its life is a busy one, producing as it does for its size a more concentrated and valuable food commodity than any other domesticated animal.

MR. E. B. MARTIN'S CHAMPION WHITE LEGHORN PULLET.

The bird illustrated was bred and exhibited by Mr. E. B. Martin, of Nelson. She won first and special prizes at Nelson this year in a class of nineteen judged by Mr. C. Cussen, Poultry Instructor, and first and special in a big class at Blenheim judged by myself, while at the same show she gained the highest award for White Leghorns under the New Zealand Championship Association's rules by winning the championship. These are the only occasions on which she has been exhibited. There is no chance breeding about this bird, as she possesses blood from some of the most noted strains in the Dominion. The male parent was bred by Mrs. J. Mills, of Dunedin, being a son of one of her Christchurch test-winners, when the six birds produced 1,478 eggs for the year. He is also a full brother to her pullet which secured first and special prizes at the Dunedin Show in 1917 in a utility class of forty-two. The mother is a cross between Mr. H. Nixon's and

Mr. H. Leger's strains. The former breeder's birds, including other noted performances, produced a world's record with 1,632 eggs for six birds at the 1912–13 Christchurch egg-laying competition; while Leger's pen of six birds in the first Blenheim test in 1905 laid 1,373 eggs for the year, which was truly a remarkable performance for those days.

While there is much need for further reform before the great bulk of the White Leghorn flocks in the Dominion reach a high standard of uniformity, there is ample evidence that a great general improvement has been effected during the past few years. This applies especially to the birds to be seen in the utility classes at the majority of our poultry shows.

GORE EXPERIMENTAL AREA.

NOTES ON THE FIRST SEASON'S OPERATIONS.

By W. J. McCULLOCH, Fields Supervisor, Invercargill.

OWING to the condition, physical and otherwise, of the land selected for the Gore experimental area at the time it was taken over by the Department it was considered advisable to devote the greater part of the land to preparatory cleaning-crops such as roots, green fodders, &c., for the first season—1917–18.

The physical condition of the land referred to, lack of drainage, and consequent stagnation of soil moisture and acidity, was plainly indicated in the growth of patches of small rushes and almost exclusive monopoly of the land by Agrostis (fiorin, &c.) and Yorkshire-fog grasses, a type of pasture much too common in Southland.

Thus the physical defects claimed first attention, and a system of drainage was carried out, the whole area being mole-drained across the main depressions at an average depth of 22 in., with drains about 4 yards apart. These were afterwards intercepted in the lower levels by 3 in. tile drains at a depth sufficient to allow the moles to discharge on top of the tiles, and joined up with broken tiles. This latter is a most important point. Some farmers contend that it is immaterial whether the moles are joined up with the tiles or not so long as they cross, but the writer is firmly of opinion that the little extra labour of placing a broken tile, board, or even turf above and between the mouth of the mole and the tiles to avoid the risk of silting is well repaid.

The drainage of the area is working splendidly, as evidenced by the large amount of water discharged at times during the past wet winter. The effect was also very noticeable in that the land could be worked soon after heavy rains. The main effect, however, with the assistance of lime, should be shown later in the rotation, in the permanency of the better grasses and healthy growth of the clovers to the exclusion of the worthless Agrostis–fog association.

For the first season only four permanent sections of test plots were laid off and devoted to experiments, some account of which follows.

FERTILIZERS IN A ROTATION.

This is an "experiment to determine the value of certain fertilizers when employed in a rotation, and also their residual and cumulative effect." The section was divided into eleven plots, each with varying rates and proportions of fertilizers, and although no definite conclusion should be drawn for a number of years, still it may be interesting to note the varied effect on the crop of Garton oats as grown last year. Following are the yields:—

Plot.	Fertilizer.	Rate per Acre.	Yield in Bushels per Acre.			Total Yields in Bushels per Acre.	Gain in Bushels per Acre over Average of Control Plots.
			Firsts.	Seconds.	Thirds.		
		Cwt.					
1	Superphosphate	2	40·80	1·15	1·00	42·95	6·025
2	Basic slag	2	42·40	1·05	0·90	43·54	6·615
3	Otago phosphate	2	42·90	1·10	1·00	45·00	8·075
4	Control	..	32·80	1·30	1·30	35·40	..
5	Superphosphate 2 cwt., blood 1 cwt.	3	43·70	1·00	0·80	44·78	7·855
6	Superphosphate 2 cwt., nitrate of soda 1 cwt.	3	41·20	1·05	0·80	43·05	6·125
7	Superphosphate 2 cwt., sulphate of potash 1 cwt.	3	45·10	1·25	0·90	47·25	10·325
8	Superphosphate 2 cwt., blood ½ cwt., sulphate of potash ½ cwt.	3	48·80	0·95	0·80	50·55	13·625
9	Superphosphate	3	51·90	0·90	0·80	53·60	16·675
10	Control	..	36·90	0·85	0·70	38·45	..
11	Basic superphosphate ..	3	38·70	2·35	0·70	41·75	4·825

This section had not been limed, yet no beneficial effect is shown in the case of the more alkaline phosphatic applications. On the contrary, the acid phosphatic manure—superphosphate (heaviest dressed)—showed to advantage, possibly on account of its quicker availability and the natural tendency of the oat to withstand a certain degree of acidity. Again, the potassic manure showed to advantage over the nitrogenous addition, but neither, or both together, apparently had the effect of an extra addition of 1 cwt. super. The whole section has now been limed, and it will be interesting to note the effect on the various manures, which are being repeated this season on the next crop of the rotation—namely, turnips. Sorrel made great headway on the section. On plot 6 the nitrate of soda was applied after the crop had well started, but no effect on growth could be seen. No appreciable difference could be detected in date of ripening, which is rather unusual in such tests. As the section was ploughed out of old lea, the addition of a quickly available nitrogenous manure may show to better advantage in later crops.

DEPTH OF PLOUGHING AND LIMING.

One of the most interesting experiments was the section devoted to "deep and ordinary ploughing, with and without lime." The first crop of the rotation on this section was rape, with 2 cwt. basic super and

½ cwt. blood-and-bone per acre. The area was divided into four plots, which yielded as follows :—

Plot.	Treatment.	Carbonate of Lime : Tons per Acre.	Yield : Tons per Acre.	Gain over Lowest Yield : Tons per Acre.
1	Deep-ploughed (12 in.) ..	1	22·143	13·500
2	Deep-ploughed (12 in.) ..	(No lime)	12·571	3·928
3	Ordinary ploughed (6 in.) ..	(No lime)	8·643	..
4	Ordinary-ploughed (6 in.) ..	1	16·857	8·214

It is quite evident that lime was an important factor on this section last season, but it is expected the true results of deep tillage should stand out more distinctly as time goes on.

FARM PRACTICES AND SOIL-FERTILITY.

A further section of ten plots is devoted to testing "the effects of various practices on soil-fertility." Crops were grown and treated as follows :—

(1.) Bare fallow.
(2.) Scotch tares. Ploughed in for green manure.
(3.) Horse-beans. Ploughed in for green manure.
(4.) Horse-beans. Harvested.
(5.) Crimson clover. Ploughed in for green manure.
(6.) Rape. Eaten off.
(7.) Purple-top Scotch Aberdeen turnip. Eaten off.
(8.) Garton oats. Harvested. (Sown with red clover at 10 lb. per acre after oats brairded.)
(9.) Garton oats. Harvested. (Sown with mustard as catch-crop after oats harvested ; this failed.)
(10.) Garton oats. Harvested.

This section had 1 ton of carbonate of lime per acre, and each crop had 2 cwt. of basic super and ½ cwt. of blood-and-bone per acre. Tares grew especially well (yielding 12·35 tons green crop per acre), as also did beans and crimson clover, although the beans rusted badly when the pods were forming. Rape gave a yield of 20·5 tons and turnips 16·929 tons per acre, while the oats were poor, only yielding up to 25 bushels per acre. The whole has been sown in an oat crop this season, when the effects of the various systems should be apparent in the yield.

GREEN FODDERS.

A comparative test in green fodders was carried out. These were fed off with sheep, and although facilities were not available for weighing stock, yet both varieties of rape appeared to have better fattening-qualities than the other fodders and turned off lambs quicker. The

following are results of the green crops by weight, giving time land was occupied, &c. :—

Plot.	Fodder.	Date sown.	Seeding per Acre.	Tillage Method.	Date of Maturity and Weighing.	Yield per Acre.	Gain in Tons per Acre over Lowest Yield.	Number of Days Land occupied.
			lb.			Tons.		
1c	Broad-leaved Essex rape	24/11/17	4	Drilled on flat, 14 in. apart	11/2/18	13·13	8·56	79
2c	Kangaroo rape ..	,,	4		,,	14·92	10·35	79
3c	Thousand-headed kale	,,	4		2/5/18	24·28	19·71	159
4c	Buda kale	,,	4	Ridged slightly, 24 in. apart	4/4/18	10·00	5·42	131
5c	Chou moellier ..	,,	4		29/5/18	17·14	12·75	186
6c	Silver-beet	,,	6		,,	4·57	..	186

ROOT VARIETY TESTS.

For these tests ten varieties of swedes, eight varieties of yellow-fleshed turnips, and six varieties of white-fleshed turnips were grown. In swedes Incomparable showed the heaviest yield, with Champion, Elephant Purple-top, Pioneer, and Monarch good seconds. In the yellow-fleshed turnips Centenary Green-top Yellow was heaviest by weight, with Fosterton Hybrid and Tankard Green-top Yellow good seconds. The white-fleshed tests showed Whitestone first, with Imperial Green Globe next.

THE STUDY OF GRASSLAND IN SCHOOL-WORK.

By A. H. COCKAYNE, Biologist.

THE grasslands offer a very fine field for the teacher who has any dealing with agricultural matters. They afford ample and readily accessible material of all descriptions. Their study really embraces the whole of farm practice, as without a good bowing acquaintance with the agriculture of any district its grassland cannot be intelligently examined. Grassland material, again, can be made use of for teaching purposes at all times of the year, as it is essentially a continuous crop.

In order to become at all acquainted with the composition and habits of grassland associations they must be under observation the whole year. The following are merely suggestions as to how grassland may be used as teaching-material in the country school and the district high school. Some of them may not fit in with the ordinary school-work, but certain phases at least should be given prominence in any agricultural course.

Identification of all Plants comprising Grassland.—Two methods of identification are really necessary. To begin with, the pupil should learn at sight the main constituents. When this is done he should be taught by means of keys to discriminate between different species by character examination. Such keys can be easily made by the teacher, and should be as simple as possible. The use of keys will be found invaluable in properly teaching the necessary terminology.

Terminology by definition alone is quite valueless, but terminology by application is a magnificent training for any boy or girl. In learning the various species of which grassland is composed care should be taken to remember that those most abundant are the important ones to know. Extremely rare plants, on the other hand, need not be bothered with, for unless they represent plants formerly abundant, or likely to be abundant in the future, they play no part. It is important to learn to identify and discriminate between different plants in all stages of their development.

Study of Individual Habits of the Different Species.—This is known as "autecology," and deals with the whole of the relations of the plant to its habitat or growing-place. Only certain phases easily taught should be attempted, such as rooting-habit, growth-form, method of reproduction, times of flowering, duration, yield, and palatability.

Study of the Combinations and Habits of the Associations.—This is termed "synecology," and the relation and effect of plant on plant should be studied; and the combinations that exist under certain conditions, together with the factors that lead to dominance and suppression, should be determined. Various phases in succession come in here, but must also be taught with full reference to the reactions due to various types of management and utilization.

The Relation of Grassland to Grassland Supplementary Crops.—The soundness or otherwise of growing different supplementary crops, and their effect or the reverse in maintaining full earning-power of grassland, should be taught, using grasslands of the district as examples.

Crop Rotations from the Grassland Standpoint.—The breaking-in of various types of vegetation into grassland, and the various rotations developing certain types of grassland, such as temporary short-rotation and long-rotation pastures, should be dealt with. The farm-management of the district will provide ample material, which should be carefully correlated with practical utility.

Seed Testing, Analysis, and Germination.—This provides very useful work, especially germination, as it gives some idea of the early development of the plant. Much farm-work is intimately connected with the early development of plants, and this phase is important. Too much time, however, should not be devoted to seed-testing pure and simple, merely to test the viability of seeds. Theoretically, seed-testing is important to the farmer, but it is only so when he grows and sows his own seeds. To the seed-merchant, of course, the testing for viability and purity is essential, and this is generally recognized.

NOTE.—The foregoing may be read in conjunction with the writer's series of articles, "The Grasslands of New Zealand," published recently in the *Journal*, which deal with most of the phases of the subject suggested for study.

Milk-pasteurization for Cheese.—The practical advantage of milk-pasteurization in cheese-factories was further confirmed by last season's experience in the Dominion. The average grade of the cheese made at the factories where regenerative pasteurizers were in use was 1·34 points higher than that of cheese made from unpasteurized milk in the same districts. The number of regenerative pasteurizers installed in cheese-factories at the end of the season was 107.

THE RABBIT NUISANCE IN CENTRAL OTAGO.

By J. P. WILSON, late Fields Inspector, Clyde.

THE regrassing of the denuded run country of Central Otago has been the subject of much discussion in recent years. It is generally admitted that the present state of the country has been brought about by overstocking, burning at the wrong season of the year, and the depredations of the rabbit. The stock-carrying capacity has been reduced to about one-third of the original. Injudicious stocking and burning have in the past done great damage, but the great present-day factor is the rabbit pest. In many parts the rabbits are extremely numerous, and are completing the destruction of the remaining native herbage.

While many of the landholders do appreciate the damage the rabbit is doing, and are energetic in their endeavours to control the pest, the majority, unfortunately, fail to do so. Their work of rabbit-destruction amounts to just sufficient to keep them out of the reach of the Rabbit Act, while the rabbits spread from their properties and in many cases multiply the work of their more energetic neighbours. On the properties of the few who have erected rabbit-proof fences and exterminated the pest the pastures are quickly improving, and the holders are reaping enhanced returns. A very noticeable and significant fact is that during winter, which is the non-breeding season but is the export season, great energy is everywhere put into the work of rabbit-catching. On the other hand, during summer, which is the breeding season but is the off season for exporting, generally very little energy is put into the work of rabbit-destruction, indicating clearly that the element of profit has a great influence on the amount of work done. If the same energy were put into the work during summer as in winter the rabbit would be soon under control.

The exporting of rabbits has grown into a big concern, many deriving a livelihood from it. It is almost a platitude, however, to state that Central Otago would be much more prosperous without the rabbit. The many thousands of additional sheep that could be carried would be a much greater asset than the rabbit industry. The country would accommodate scores of extra settlers. The "Central" is magnificent sheep-country; its soil is fertile right up to the hilltops. Its possibilities are great, but progress is being held back by the rabbit. The main step necessary in regrassing is an all-the-year-round, energetic, uniform campaign of rabbit-destruction until the pest is got under. While the present production of rabbits for export continues just so long will the country remain in its present state.

The eradication of the pest in the "Central" will not be accomplished easily or without considerable expense to landholders. The climate is ideal for the rabbit. It has a long breeding season, young rabbits showing up from July to February. The system of rabbiting will have to undergo great alterations before any material advancement is made. For some years trapping has been the most prominent method

adopted, in the majority of cases this being so arranged that the work of rabbit-destruction is carried out free of cost to the landholder. In other words, it is so arranged that the rabbit pays for its own (partial) destruction. As the export season approaches trappers are in demand. Usually the landholder allots to a rabbiter the right to trap on a defined block of his country, the trapper deriving his remuneration from the sale of his catches. Very often there is a suspicion that bonuses or royalties are paid by the trapper for this right, while in many cases the landholder stipulates to which firm the trapper must sell his catches. The natural conclusion is that the landholder has a motive for doing so; otherwise why should it interest him how his trapper disposes of his catches? During the first three months of the export season the earnings of a trapper are substantial, the price received by him being on an average upwards of 6d. per pair, and cheques for £100 for a month's work not being uncommon. A local newspaper last winter published the following paragraph:—

> Rabbit-trappers in Central Otago continue to make very handsome cheques; £3 per day is quite a common thing, and we are told that a man in the Alexandra district actually received for his month's cheque only a few shillings short of £100. Who wouldn't be a rabbiter? Quite a number of trappers must be making from £400 to £500 per year, and some a good deal more. By the way, it would be interesting to know how many of them pay income-tax.

By the time the export season closes the pest is much reduced, but by no means cleared. On many properties the work of destruction ceases with the closing of the export season, nothing further being done unless forced by the Rabbit Inspectors. Numbers of landholders, however, do carry on the work after the close of the export season, usually paying the trapper from 12s. 6d. to 15s. per hundred for well-preserved skins. Some pay for undersize and nesters' skins, but others will not pay for these. The trapper continues on, but more often than not the rabbits increase faster than they are destroyed by this means. In some cases the trapper does succeed in reducing the pest until his daily catch is insufficient to earn a wage. An appeal to the landholder for an increase in price is generally refused, the latter considering that his country is in a good state when a trapper cannot "make a do" on it, so the work of destruction ceases. Just when the pest is about to be mastered it is given the necessary respite to recuperate, and it is surprising how quickly it can do so.

As a general thing the work of the trappers is not sufficiently supervised by the landholders. The usual custom is to allot a block of country to a trapper, allowing him to go as he pleases. It sometimes occurs that the trapper rushes over his block, taking the cream of the rabbits off, and then deserts it. There are instances of runholders keeping the pest well under control, principally owing to their system of supervising the work of their trappers. Their system could be copied with advantage by all landholders. A block of country is allotted to a trapper, but it is again divided into three or four sections. The trapper is directed where to start, and he has to clear each section satisfactorily before he is permitted to shift on to a fresh section. This

entails good work. It has the effect of averaging the trapper's earnings, while it prevents skimming the block and then deserting it.

Here it may be mentioned that the trapping system has the great disadvantage of exacting heavy toll on the natural enemy of the rabbit. It is noticeable each year that stoats are numerous in the autumn, and that in the spring they appear almost extinct. It is nearing the autumn before they breed up again. Stoats are delicate animals, and are generally dead when found in the trap. Even if they were liberated alive it is doubtful if they would survive their injuries. Ferrets and cats are hardy and would survive, but the trapper who liberates these alive is an exception.

A great weakness of the present system is that in numerous cases the same rabbiter traps the same block of country year after year. He therefore nurses it—that is, he allows the rabbits to increase during the summer so that it will be lucrative again to him during the ensuing export season, the greater price received during the export season making it profitable to do this. Poisoning, which is the most effective method of dealing with the pest, is greatly used, but only as subsidiary to trapping. In some instances landholders when allotting a block of country to a trapper stipulate that the trapper shall during the off season poison the country gratis, the holder providing the poison. Probably the rabbiter intends to trap this block the following export season. This places him in a false position; his personal interests are that the rabbits shall be allowed to increase, and he is asked to carry out work which is more or less "dead horse," work that will rob him of the benefits to be derived from trapping. Naturally poisoning under such conditions is seldom satisfactory.

To poison successfully great care has to be taken. Cleanliness in the manufacture and laying of the poison is essential. The rabbits must be left undisturbed for some weeks until the element of fear has been allayed and the animals are off their guard, as they are very cute. It is as easy to lay poison to offend as to attract. There are known methods of putting the rabbits on their guard and nullifying the effect of laying poison. It is almost impossible to get a successful poisoning following closely upon a trapping campaign, yet in some instances it is carried out immediately after, resulting in the landholder condemning the poison instead of his lack of judgment of how and when to use it. Many failures with poison can be attributed to (1) quite insufficient poison being laid, (2) the manner in which it has been laid, (3) the poison not being properly prepared. The Department of Agriculture retails poison manufactured by experts at a price that does not cover its cost, and yet some landholders with crude appliances still manufacture their own! For a long time phosphorized pollard has been the most commonly used poison, but during the last two or three years strychnine applied to carrots, turnips, or grain has been used with excellent results.

On outlying runs, from which it is difficult to bring the rabbits out to the factories in the export season, poisoning is the general system adopted. The rabbits are invariably kept down better on these runs than on the trapped country, while the natural enemy gets a chance to increase and undoubtedly assists to control the pest. Poisoning is seldom a failure on the properties of landholders who are recognized as keen

rabbit-destroyers. By doing away with the export of the rabbit carcase the trapping system would very soon become subsidiary to poisoning. Had the landholders to pay out cash for the great numbers of rabbits destroyed during the export season they would take every care that the rabbit was not allowed to go on breeding unmolested during the summer months. When they had them down they would take every precaution to keep them down. Poisoning would be undertaken with care, entailing better results, and, as indicated, the natural enemy would get a chance to become of service. Before the advent of the export trade poisoning was the chief method used to keep the rabbits in check. Runholders who have had experience of both systems state that in the old days they kept their rabbits down better than they do now, and that they intend to revert to the old system.

It has been estimated that five or six rabbits will eat as much as a sheep. Personally I doubt this, but it is safe to say that ten will do so. If an extra sheep could be placed in Central Otago for every ten rabbits now existing there the economic result for the district would be striking indeed.

"Whale-feed" as Fertilizer.—At the last meeting of the Board of Agriculture a letter was received drawing attention to the enormous quantities of whale-feed which occasionally occurred in the southern coastal waters of New Zealand, and suggesting that the Board should have some of it analysed, when, if the analysis was satisfactory and the material proved of manurial value, arrangements might be made to obtain a quantity of it for the benefit of farmers and local manufacturers. The Board had made inquiries and ascertained that Mr. G. M. Thomson, of Dunedin, had already been making some research into this matter. He had reported that for some reason or other whale-feed has been very scarce for the past two or three years, and that during the past nine months not a solitary specimen had been seen in his locality, though they would probably turn up again some day in billions.

WALLACEVILLE LABORATORY (REAR VIEW, SHOWING OUTBUILDINGS).

SEED-TESTING NOTES.

IDENTIFICATION OF THE POAS.

By E. BRUCE LEVY, Biological Laboratory.

IDENTIFICATION of the Poa seeds is rather difficult, but owing to the widely divergent nature of the various species as pasture constituents it is essential that their identity be established. In the case of grass-seeds so much alike it is not to be wondered at that adulteration and substitution occur—not necessarily, however, from any motive to defraud.

Excluding Poa annua, a common annual grass abundant on all moist soils throughout New Zealand, there are four species of agricultural significance. It has become customary among seed-merchants and many farmers to designate these by their botanical name. They are as follows :—

Poa pratensis (Kentucky blue-grass, or smooth-stalked meadow-grass).

Poa compressa (Canadian blue-grass).

Poa trivialis (Rough-stalked meadow-grass).

Poa nemoralis (Wood meadow-grass).

Poa pratensis is generally known in those districts where this grass ranks more as a weed than as a good pasture-grass as "twitch." This, however, is a wide term, including all those grasses which have long underground stems. Poa pratensis is the most widely used seed of these species, and the greater portion of New Zealand's requirements is imported from America, mostly from the States of Kentucky and Missouri. A little is saved in New Zealand, being either stripped from pure Poa-pratensis paddocks or dressed out of cocksfoot and rye-grass.

It is interesting to note the vastly superior germination capacity of the New-Zealand-grown seed over that of imported origin. The following table gives the germination capacity of imported seed :—

	Minimum. Per Cent.	Average. Per Cent.	Maximum. Per Cent.
Poa pratensis, 1917	11	42·60	83
,, 1918	1	31·50	69
Poa trivialis, 1917	12	25·25	39
,, 1918	6	28·25	38

Two samples of locally grown Poa pratensis tested last month gave 80 per cent. and 86 per cent. respectively. A small lot of Poa trivialis harvested by the writer in this district some two years and a half ago showed last month a germination of 81 per cent. The low germination of the imported seed is due mainly to the large amount of empty glumes present, and not so much to the germination falling off in transit. The

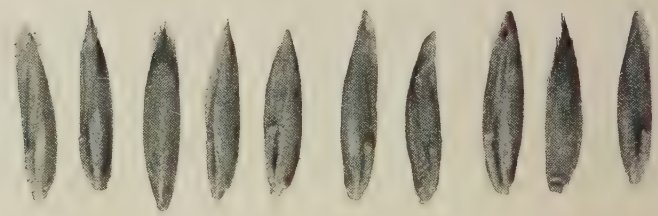
SEEDS OF THE POA GRASSES.

(Magnification 10 diameters.)

POA PRATENSIS.

POA COMPRESSA.

POA TRIVIALIS.



POA NEMORALIS. *E. Bruce Levy, photo.*

percentage of empty glumes on analysis works out from 20 to 54 per cent., with an average of approximately 40 per cent. The average germination for the lines of which these analyses were made is 41·5 per cent. Two lines showing 66 and 55 per cent. kernels gave a germination of 63 and 48 per cent. respectively. Two other lines, however, showing 80 and 61 per cent. kernels, gave a germination of only 38 and 18 per cent. respectively. Just what was responsible for the low vitality of the latter two lines is difficult to say. A fair number of the kernels, however, were immature.

Poa trivialis and Poa pratensis are rarely adulterants one of the other, but cases of substitution have occurred. Poa compressa is really the one to be on the lookout for, both as an adulterant and substitute for Poa pratensis. Poa compressa is generally ranked as being

DRAWINGS SHOWING TEETH ON MARGINAL NERVE OF PALEA OF POA SEEDS.

(1.) Poa pratensis. (2.) Poa compressa. (3.) Poa trivialis. (4.) Poa nemoralis.

useless, but on poor land, especially if deficient in lime, it is not inferior to Poa pratensis. On moist limestone country, where Poa pratensis gives its maximum yield, Poa compressa, naturally a low yielder, is to be avoided. Poa compressa is not common in New Zealand pastures, but there are certain localities where it has been unintentionally sown for Poa pratensis.

There is very little Poa-nemoralis seed sold in New Zealand, but a little was grown for some years in the Te Kuiti district. This was sold as Poa trivialis, a quite unintentional mistake by the vendor, Poa nemoralis at the time commanding a higher price than Poa trivialis.

In the identification of these four seeds the accompanying illustrations and descriptions should furnish a reliable key, and, provided one has a microscope magnifying up to 100 times, identification by an examination of the marginal edge of the palea or inner flowering-glume is fairly

simple. The palea is that glume occupying the front portion of the seed and at the base of which the rachilla or seed-stalk is situated.

When the seed is in bulk the eye is a very reliable indicator of identity, provided one has handled quite a number of samples of each seed. To the eye inexpressible differences are clear, and one can tell the seed not so much by specific characters as by general appearances—in much the same way as one tells an acquaintance not by his having blue eyes or grey, but because one knows the person.

BOTANICAL DESCRIPTION OF POA SEEDS.

Poa pratensis.

Size: Average length, 2·62 mm.; average width, 0·63 mm.

Shape: Typically boat-shaped; strongly keeled; apex pointed, but usually broken.

Surface dull; glabrous or (in undressed seed) slightly downy. Lemma 5-nerved; nerve on each face fairly indistinct. Colour light to dark straw. Palea toothed on marginal nerve; teeth large, regular, widespread, not extending to tip of palea. Palea closely adhering to caryopsis, separation difficult in well-matured seeds.

Poa compressa.

Size: Average length, 2·38 mm.; average width, 0·58 mm.

Shape: Typically boat-shaped; strongly keeled; apex bluntly pointed, with lemma somewhat expanded.

Surface dull, somewhat smooth; glabrous; lemma 3–5-nerved, but nerves on face very indistinct—practically absent. Colour light to dark straw. Palea toothed on marginal nerve; teeth small, fairly uniform, closely spaced, extending right to apex of palea. Caryopsis fairly easily separated from palea and lemma.

Poa trivialis.

Size: Average length, 2·42 mm.; average width, 0·57 mm.

Shape: Typically boat-shaped; strongly keeled; apex narrowly pointed, but often broken off.

Surface dull, although somewhat bright; glabrous, but usually a tuft of downy hairs on pedicel. Lemma thin, almost transparent, 5-nerved; nerve along middle of each face distinct.. Colour usually pale straw. Palea toothed on marginal nerve; teeth small, uneven, usually mere triangular projections, closely spaced, extending to apex of palea. Palea closely adhering to caryopsis; separation fairly difficult.

Poa nemoralis.

Size: Average length, 2·72 mm.; average width, 0·55 mm.

Shape: Typically boat-shaped; keeled; apex fairly finely pointed.

Surface dull, usually downy, particularly so on rachilla, along keel, and marginal nerves of lemma. Lemma 3–5-nerved. Nerves down middle of face indistinct—practically absent. Colour pale straw tinted with yellow. Palea toothed on marginal edge; teeth uneven, small and large, closely spaced; large teeth drawn out to a fine point and usually closely appressed to marginal edge; teeth extending to apex of palea. Caryopsis easily separated from lemma and palea.

Inoculation against Blackleg.—As a result of the extension of the blackleg-declared areas in the Auckland Provincial District last year the work of inoculation of calves was very largely increased. During the last official year 226,100 doses of vaccine were sent out from the Wallaceville Bacteriological Laboratory for use in the Auckland and Taranaki Districts, as compared with 133,880 doses in the previous corresponding period. The effect of this inoculation work is satisfactory, the mortality from the disease having been very small.

PLANT-IMPROVEMENT WORK AT WERAROA.

By J. BEVERLEY, Assistant Agriculturist, Central Development Farm.

THE following progress notes on the plant-improvement activities at the Central Development Farm may be of interest to those who have visited this section at the farm during the past year, and to others interested in the improvement of our forage and food crops.

Cocksfoot.—The great value of this grass in general is recognized, but not usually the wide variation that occurs in individual plants. With a view to isolating and multiplying superior strains improvement work was commenced by the Department at Moumahaki Experimental Farm five years ago, and is being continued at Weraroa. Cocksfoot No. 29 is above the average for vigour, and establishes itself quickly when sown in a mixture. Cocksfoot No. 61 is a fine-leaved form, and gives a satisfactory growth during winter.

Moumahaki Prairie-grass.—This selected strain continues to give satisfactory results under pasture conditions as a good winter grass, and every effort is being made to provide seed for the many farmers who are wanting it. A reselected stock has been established at Weraroa by autumn sowing. From this pedigree culture larger plantings will be made. For seed purposes it has been sown in rows. In order to get the best seed-crop results cultivation between the rows is necessary.

Italian Rye-grass.—Individual plants of exceptional vigour are not uncommon in Italian rye-grass. Western Wolths, which is said to have been found on the roadside by a labourer in Holland, is a striking example. At Moumahaki last year a quarter acre was sown with the produce of one selected plant two years after its discovery. Five thousand single plant selections were grown at Moumahaki in 1915, and in the following year comparative trial plots were sown with the best of them. About the end of March last ten of these selections were established on $\frac{1}{80}$-acre plots at Weraroa.

Black Foxtail (Alopecurus nigricans).—Passing mention should be made of this grass, which has a claim for consideration by agriculturists. It gives a very satisfactory plant-growth when established, and when allowed to seed it is not attacked by the foxtail-midge to any great extent.

Bromus patulus.—This variety of the brome-grasses may be considered useful. A selected stock of it has been sown for seed-production and experiment.

Weraroa Vetchling.—This forage plant somewhat resembles the sweet-pea in growth. The seeds are larger than the Scotch vetch and similar in colour. It is hardy, and can be sown for the same purpose as vetches and in the same manner. It is more self-supporting than the vetch, and would be very satisfactory if made into hay. Cattle are fond of the straw after the seed has been threshed. Sown at Weraroa the end of January last, it was cut for feed in May, providing a very bulky crop at that time. It can also be carried through to spring, yielding excellent fodder at any time during the winter.

Moumahaki Vetch.—This valuable selection has been removed to Weraroa as a matter of convenience in working up a stock.

Perennial Red Clover.—Runciman's red clover was the best of the many varieties grown by the Department of Agriculture at the Auckland Exhibition of 1913–14. In a trial at Moumahaki of different red clovers sown in early winter Runciman's was the least affected by frost and was the best. Sutton's Giant Hybrid cow-grass is much like Runciman's clover. Whilst 2,000 single plants of red clover were being examined at Moumahaki one plant was discovered with white flowers and white seed, and 5 per cent. of the plants in the next generation gave white flowers and white seed. Red clover A133, one of the selections made at Moumahaki, has been transplanted to Weraroa. Before it was a year old it was lifted and split into 150 divisions, and replanted in April, 1917. Since then each division has become a vigorous plant. In this particular line of red clover the flowering-stems get roothold of the ground instead of dying back in the usual manner after flowering.

True Scotch Kale.—This may be described as a valuable garden-plant, and as having a value for cow-feed from January onwards if the plants are regulated by cutting in the spring. It has been grown by a few people in Taranaki for a number of years, and in one instance it has been grown continuously for twenty years without going to seed. To increase the stock it is necessary to take cuttings or remove slips from the growing plants and dibble them into the ground about the end of March in this country. Owing to the leaves being very much curled this kale is not as a rule affected or damaged to any extent by larvæ of the diamond-back moth.

White Japanese Radish.—The size of this plant has been worked up by degrees, and it is now regarded as big enough to be considered a cattle-radish. These radishes and some turnips were sown at Weraroa in January of this year for comparison. Whilst the turnips were more or less a failure, the radishes were ready for stock-feed in three months. Bulbs weighing from 5 lb. to 10 lb. were common, and in an experiment of feeding the radish to dairy cows no flavour was detected in the milk. As regards habit of growth, it keeps well above ground, and its shape is similar to that of the White Sugar mangold.

Soft Turnips.—Sutton's Red Paragon and Sutton's Aberdeen Green-top Yellow were allowed to seed together at Moumahaki last year to note the effects of cross-fertilization. A few bulbs of these varieties had gone through the winter without rotting, and were selected for the purpose. The progeny of each seed parent was mixed, but quite a satisfactory crop was obtained. A control sowing of imported seed of these two varieties was made alongside the cross-fertilized plot. If the cross-fertilization is simply the first cross, as in this instance, a farmer might safely sow his locally produced seed.

Peas.—Stratagem and Green Imperial have received attention, and selections from these two varieties are being worked up at Weraroa. Another new pea from a cross made in 1909 is prominently coming to the front. It was seven years before it was considered as having arrived at the purity stage.

Linseed or Flax.—Several varieties have been grown this season for fibre as well as for seed-production. Selected plants have been secured to continue the improvement of this plant for its respective uses.

Mangolds.—The mangold requires a warm, fairly dry climate, and having few enemies in the shape of insect pests it should be grown more

than it is in New Zealand. Several distinctly good selections from Sutton's Prizewinner Globe are being grown at Weraroa for seed purposes, as well as other varieties. At Moumahaki some of Sutton's Prizewinner Globe sown three years ago did not run to seed the following summer, but increased in size up to 50 lb. each, and went through three summers and two winters before reproducing themselves by seed. They were sown under field conditions in October, 1915, were transplanted from the field for seeding purposes in August, 1916, and seed was harvested in March, 1918, the actual period of growth being 877 days.

Maize.—Early Yellow Canada and Minnesota No. 13 were sown on 21st December, 1917. The former variety produced a few ripe cobs in spite of the lateness of sowing; it seemed to stool out well, and to be more suitable for forage purposes than for a grain crop. Minnesota No. 13 did not stool out, but produced a satisfactory grain crop sufficiently ripe to be of value for either pigs or poultry.

Potatoes.—The introduction of new disease-resisting varieties becomes necessary if the older sorts get worn out through neglect or other reasons. Artificial crossing is then required. With potatoes the process of crossing is very simple, as the flowers are large and the organs easy of access. The difficulty is to find sorts of known value which are properly equipped to participate in this process, since the production of pollen in the case of this plant is very irregular and altogether absent in some varieties, such as Up-to-Date and British Queen. A little over three thousand first-year seedling potatoes were grown last season, and 242 of these have been kept for further trial. Seedling potatoes a year older are also under test at the present time.

SHIPPING CHEESE AT WELLINGTON.

WORK FOR THE COMING MONTH.

THE ORCHARD.

THE advice on orchard work from district Instructors, which follows, can be relied upon to give satisfaction if properly applied, but it rests with the orchardist to vary these instructions to meet special circumstances. In the case of spraying, the weather conditions may be such as to necessitate a renewal of any of the sprays recommended at a very much shorter period than that stated. Similarly, in particular as regards fungus diseases, it may in the event of severe attacks become necessary to considerably increase the strength of the spraying formulas, even at the risk of spray damage, or to substitute bordeaux where lime-sulphur is being used.

Reference is made to the advisability of thinning the fruit crop. This is a matter that is only too often neglected or inadequately performed. An American writer remarks on this matter, "After having thinned the crop go over the tree and take as much more off." This is intended to imply that the work is usually only half done. In the case of normal crops of stone-fruits thinning is essential, and the same usually applies to pip-fruits also, and in the interests of the crop and effective spraying it should not be neglected.

Disbudding is another work of considerable importance. More can be done in shaping a young tree during the early summer than at any other time. By checking and removing misplaced growths greater advantage is given to those which go to form the framework of the tree. It often happens that a well-placed growth is temporarily checked through injury from wind, &c., resulting in an unfavourably placed one taking charge and dwarfing the other. Periodical attention may largely remedy such disabilities, but the removal of growths in the summer should be done early and not be carried to excess, otherwise serious damage is likely to result.—*J. A. Campbell, Assistant Director of the Horticulture Division.*

AUCKLAND.

First early peaches will be ready during the first fortnight of December, followed closely by Triumph and Admiral Dewey. First early apples will come in at the end of the month. Strawberries and loganberries will be in good supply. Special care should be taken to gather fruit at the proper time, and to prevent the marketing of fruits of any class either in an immature or overripe condition.

The most important operations to be carried out during the month are harrowing and cultivating; disbudding; spraying for codlin-moth, bronze-beetle, leaf-roller caterpillar, pear-slug and red mite, black-spot, coniothecium, bitter-rot on pip-fruits, brown-rot and black-aphis on stone-fruits, also leaf-roller, verrucosis, and grey-scab on citrus fruits.

Where the disbudding of young trees as recommended in the November notes has not been attended to immediate attention is desirable before the shoots become too long to be conveniently removed by pressure with the thumb. If, however, they have reached a length of 2 in. or over the use of a sharp knife will be found the most expedient and obviate danger of injury to the tree. These remarks refer

also to old orchard-trees which have been regrafted; all shoots on the old stumps should be entirely removed from time to time.

Codlin-moth, leaf-roller, bronze-beetle, and pear-slug: Following on from directions given last month, spraying every twenty-one days should suffice, using arsenate of lead.

Black-spot, coniothecium, bitter-rot, &c.: Where required further application may be made of bordeaux, 2–3–40, or lime-sulphur, 1–100, in conjunction with arsenate-of-lead sprays.

Brown-rot and rust on stone-fruits: The spray recommended in the advice for November—*i.e.*, one month after "fruit set"—will have been applied during the earlier part of that month, and, should circumstances demand it, further applications may be made four-weekly, using either self-boiled lime-sulphur, 8–8–50, or commercial lime-sulphur, 1–125. As many varieties of peaches appear much more susceptible to attack from brown-rot at a period just prior to "colouring," growers should keep careful watch and detect infection wherever possible, all infected fruits to be immediately destroyed.

Black-aphis: This may be controlled by use of Vistolene, 1–100, or McDougall's insecticide, 1–50, two applications generally being required.

Verrucosis of lemon: Growers are advised to spray with bordeaux, 4–4–40, when early summer growth has hardened. Arsenate of lead, 2 lb. to 50 gallons, should be applied when trees are growing, if trouble is being experienced with leaf-roller.

Spraying summary: Peach, nectarine, and plum: Commercial lime-sulphur, 1–120, or self-boiled lime-sulphur, 8–8–50—when fruit shows colour.

Pear, apple, quince: Commercial lime-sulphur, 1–90 to 1–100—about one month after fruit set; in conjunction with arsenate-of-lead paste, 1½ lb., or powder, ¾ lb., to 50 gallons—every twenty-one days.

Lemon and orange: Bordeaux, 4–4–40—when growth hardens and blossom-petals fall.

—*J. W. Collard, Orchard Instructor, Auckland.*

HAWKE'S BAY.

Apples and pears: December will take the fruitgrower over his most anxious period; the weather at this period is usually more settled, and the danger from black-spot infection thereby considerably lessened. However, keep a watchful eye for this disease. Where lime-sulphur, 1–100, has been previously used, now dilute to 1–120, and make a further dilution to 1–130 when combined with arsenate of lead. Use bordeaux, 2–3–40, if spot is troublesome. Spray for mildew at intervals of three to four weeks; either lime-sulphur or atomic sulphur is effectual. Arsenate of lead, 1½ lb. paste or ¾ lb. powder to 50 gallons, should be used at about the same intervals for the control of codlin-moth, leaf-roller, and pear-slug.

Peaches, nectarines, and apricots: Sneed peaches will be harvested early in December, the other early varieties following in close succession. Trouble from brown-rot can be anticipated at this period if the weather is showery. It is a wise precaution to spray all these fruits seven to fourteen days before harvesting with lime-sulphur, 1–125. By the second or third week in November growers will know fairly definitely what fruit is holding. Thinning should be commenced and completed before the stoning-period. When in doubt pull off—the object being quality before quantity. Leave no fruits touching; this is where brown-rot often starts.

Plums: Keep leech under control; spray with arsenate of lead, 1 lb., or hellebore powder, 1½ lb., to 50 gallons water, using the latter towards the ripening-stages. For brown-rot and rust spray with bordeaux, 2–3–40, or lime-sulphur, 1–100.

Developing young trees: Young trees should show fair growth by the third week in November. Much useful training-work can be done at this period. Remove all inside growths and surplus leaders; this will divert the energy where required. Use a sharp knife; a jagged wound invites the free entry of woolly aphis.

Woolly aphis: This pest will be evident on the young growths as well as on the older parts of the trees. An early spray in December with nicotine sulphate (Black Leaf 40), 1–800, is desirable. A coarse nozzle backed up with a high pressure is indispensable for the best results. Three to four pounds of soap to 100 gallons will increase the efficiency. Do not use soap when combined with arsenate of lead.

—*G. Esam, Orchard Instructor, Hastings.*

NELSON.

Spraying stone-fruits: These trees should be sprayed, a month or so before the crop is ripe, with lime-sulphur, 32° Baume, 1–125, or self-boiled lime-sulphur, 8–8–50. (For preparation of self-boiled lime-sulphur, see last July *Journal*, p. 47.) Considering the important part played by the different orchard insects in spreading brown-rot fungus, a sharp lookout should be kept for leaf-roller, aphides, &c., in the trees, and if they are present arsenate of lead, 3–100, or Black Leaf 40, 1–800, should be applied. The lime-sulphur spray will check the San Jose scale.

Spraying pip-fruits: Spraying recommended last month should be continued as necessary. Lime-sulphur is a good remedy for powdery mildew and red mite, which are often prevalent at this season. Tender varieties of apples, such as Munroe's and Cox Orange, should be sprayed with a weak mixture, and the number of applications reduced to as few as possible.

Disbudding: The disbudding of young fruit-trees should be completed as early in the month as possible, care being taken not to overdo this operation. If there is any doubt about the advisability of "stopping" a certain growth, give it the benefit of the doubt and leave it.

Thinning the fruit: This operation should be pushed on steadily; in this district it is most essential.

Cultivation: In the majority of our orchards good cultivation at this season of the year is the chief factor in securing good vigorous condition in the trees. Many orchards are in far too rough condition; a 12 in. plough-slice on stiff land is too wide, and if allowed to dry out before disking a very heavy task is before the grower. Poor growth will be made by the trees under such circumstances. The disk harrows are implements of heavy draught at any time, and to deal with a problem such as indicated a very heavy set of implements is required. It is better to do more work with the plough and less with the disk harrows. Better results will be obtained on stiff land by cutting a narrower plough-slice and using the lighter orchard disk harrows, which can be worked close up to the trunk of the trees. The hand-grubber so much used in some orchards can in these circumstances be almost dispensed with. —*W. C. Hyde, Orchard Instructor, Nelson.*

CANTERBURY.

Work in the main will be the continuation of summer spraying.

For the control of codlin-moth, leaf-roller caterpillar, pear-slug, and any other eating or chewing insects, arsenate-of-lead paste, 1½ lb., or powder, 1 lb., to 50 gallons water, is recommended. Spray every twenty-one days up to within two or three weeks of picking the fruit.

To prevent black-spot on pears spray with bordeaux 3–4–40; and for apples use lime-sulphur, 1–100 to 1–120. For woolly aphis Black Leaf 40, 1–800, makes a good spray, and this may be combined with arsenate of lead. For powdery mildew lime-sulphur, 1–100, or atomic sulphur, 10 lb. to 100 gallons of water, is recommended. For red mite use lime-sulphur, 1–100 to 1–120.

Harvesting of small fruits: Cherries and a few of the other earlier stone-fruits will be harvested this month. Great care should be taken to see that the fruit is carefully gathered and put on the market to the best advantage. Every care should be given to sizing and packing, and the container or case should be clean and attractive. A little time and trouble given to these points will be amply repaid in the price obtained for the article. Too frequently old cases are used that have been lying about for a considerable time. With the new cases more attention should be given to the thorough drying of the timber, and extra care when making, so that the case will appear neat. After being made up the cases should be housed, so that they will not become weather-beaten before being sent to market. —*W. J. Courtier, Orchard Instructor, Christchurch.*

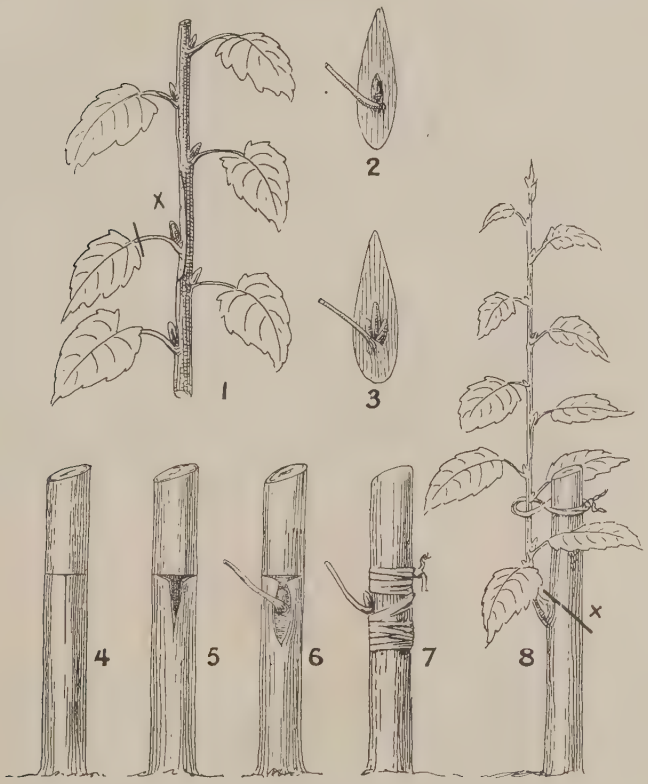
OTAGO.

During the latter part of November and the first weeks of December growers will need to have all the main operations dealing with care of the orchard well in hand, as the early fruits will soon be claiming all their attention. Spraying is the most urgent operation, and must be persisted in if the best results are to be obtained.

Codlin-moth and leaf-roller caterpillar: Apples and pears must be kept protected with arsenate of lead—in powder ¾ lb., and paste 1½ lb., to 50 gallons, at intervals of seventeen to twenty-one days. The fruit grows very fast at this time of the year, and if the interval is too long parts of the fruit will be unprotected.

Cherry and pear leech: This is also hatching out at this time. Spray cherries, plums, quinces, and pears with arsenate of lead as soon as the larvæ begin to hatch. If found necessary to spray ripening fruit, use 1 lb. of hellebore to 20 gallons of water a few days before picking. This will not mark the fruit, and is perfectly safe.

BUDDING OF FRUIT-TREES.



(1.) Shoot of current season's growth, with buds; × Indicates how to cut out bud; remove leaf at line /. (2.) Single bud ready for insertion. (3.) Triple bud ready for insertion. (4.) Incision made through bark of stock. (5.) Same with bark opened. (6.) Same with bud inserted. (7.) Bud tied. (8.) Growth from bud tied to snag of stock; snag to be cut off at × after midsummer.

From drawings by W. H. Taylor.

Red mite, woolly aphis, peach-aphis: The first mentioned of these is well controlled with lime-sulphur, 1–100 to 1–120, but the operation must be repeated, as it only kills those at present hatched. Atomic sulphur, 10 lb. to 100 gallons, is also recommended. This can be applied with arsenate when spraying for moth. Woolly aphis and peach-aphis are well controlled by using Black Leaf 40 (nicotine sulphate) at 1–800.

Pear-mite (*Phytophis pyri*): Growers sometimes wonder what is the matter with the foliage of their pear-trees. The peculiar blotchings somewhat resembling leaf-curl in its early stages are due to this mite. Very little can be done for this trouble during the summer. Kerosene emulsion may be used, but the mite is safe between the leaf-tissues. Spraying with oil in the winter is the remedy, thereby destroying the eggs round the limbs and bark crevices.

Brown-rot on stone-fruits: I am not aware that this disease has made its appearance in the Otago District, and would be glad if growers would call my attention to it if it appears. In case of infection see methods of control in the Auckland and other district notes.

Black-spot: The danger of this should be passed now in the drier parts of the district, but in the wetter parts spraying should be continued if the weather is favourable to the spread of the fungus. Use bordeaux, 3–4–40 on pears, and lime-sulphur, 1–100 or 1–120, on apples, except in bad cases, when bordeaux, 2–3–40, could be substituted on the hardest-skinned sorts.

Powdery mildew: This is the most troublesome fungus in the district, and needs to be dealt with systematically. Keep the lime-sulphur spray going, at 1–100 to 1–120, every three to four weeks, remembering that as the buds develop the spores are enclosed for next season's infection. Choose cool weather if possible, and avoid spraying in excessive heat or hot winds. Atomic sulphur can also be used at 10–100. Arsenate can be added, but the question of the combination of lime-sulphur and arsenate is still somewhat doubtful, though many growers use it with good results.

Thinning: Thinning of apples should be proceeded with, and all fruit removed from young trees up to four years planted, and also taken off the previous season's growth on others, especially the weaker trees. Peaches and plums should also be thinned as soon as the fruit is definitely set. Thinning of apricots should be finished by this time, but many trees require again relieving where there are bearing crops.

Grafted trees: Attend to grafted trees, cutting the ties where the scions are well away, so as to prevent strangling; neglect of this often accounts for the loss of many grafts. Remove surplus shoots and suckers, and paint all knots and cuts on the stock with strong oil emulsion, 1 oil to 2 water. This will save the scion becoming infected.

Strawberries: Stir up the soil in the strawberry-plots, and mulch ready for the ripening fruit. —*J. H. Thorp, Orchard Instructor, Dunedin.*

POULTRY-KEEPING.

By F. C. BROWN, Chief Poultry Instructor.

With the advent of summer the poultry-keeper's chief thoughts will be devoted to the care of his growing stock—studying their requirements and making the conditions as ideal as possible, thus taking no risk of the young birds receiving a set-back during the trying hot months.

In the first place, the birds should be provided with an abundance of nourishing food, of which good plump oats are always a valuable part. Forcing-foods, such as meat, should be fed separately, else it will have the effect of bringing the pullets to lay at too early an age and before they attain proper development. At this season of the year the value of green food for young poultry stock can hardly be overestimated. There is nothing better than young tender grass. Usually, however, as the season advances any green material in the runs becomes too tough and fibrous for the birds to relish it. Therefore where birds are kept in confinement, and especially on bare runs, it is imperative for the best development of the growing chickens that other green food, such as watercress, chaffed lucerne, clover, lettuce, or cabbage, be supplied daily. Even with the adult stock an ample supply of green

material will not only tend to promote good health and an increased egg-yield, but it also gives the yolks a rich colour and a decidedly better flavour.

Grit is another essential to the well-being of fowls of all ages, and should be always available for them to pick at. It should be remembered that fowls have no teeth with which to masticate their food, and that grit acts as a substitute. Therefore proper digestion cannot take place unless the gizzard contains sharp gravel, grit, or similar material, and without good digestion a bird cannot maintain good health and strong bodily vigour. In addition to grit, laying-hens should have crushed oyster or other sea shell always in reach of them to provide shell-forming material. Burnt or, rather, charred bones, put through a grit-mill are also good for shell-making, and are much relished.

Cleanliness is one of the most important factors in the management of young stock. It is next to useless to expect growing chickens to thrive and do well unless the quarters are kept in a thorough sanitary state. All droppings should be frequently removed, and the quarters given a good spraying with a strong disinfectant. At this time of year all classes of poultry should be provided with a dust bath, the natural means of freeing themselves of insect pests. Without a place to dust in fowls are sure to become infested with vermin, and it is impossible for them to do their best when continually attacked by these pests. The best place to make a dust bath is in a dry spot under a tree. If this is frequently dug up the birds will revel in it.

On no account neglect to give the birds a continual supply of clean drinking-water; this is a most important matter in connection with poultry-keeping.

THE APIARY.

By E. A. EARP, Apiary Instructor.

REQUEENING.

By this time the beekeeper should be able to decide which of his queens are fit to carry on through the season, and which should be destroyed and replaced by new ones. During the swarming season it is a simple matter to obtain good ripe queen-cells for requeening purposes. A few nucleus hives are a valuable asset in any apiary, and may be utilized throughout the summer for the purpose of hatching and mating relays of young queens. In addition to the employment of queen-cells produced under the swarming impulse (and such cells are usually of the best quality) there are several methods of artificial queen-raising in practice among commercial beekeepers. Most of these are described in any text-book, but are sometimes regarded as too intricate for the average man. A simple method, and one frequently very successful if only a small number of cells is required at once, consists in raising several frames of eggs and very young brood above an excluder, confining the queen to the bottom story. At the end of ten days or so there should be several good queen-cells on the frames above the excluder ready to transfer to nucleus colonies. These cells should be carefully cut from the combs without any jarring or shaking, and grafted on to combs in the nucleus hives.

On no account should the queen-cells be removed before the tenth day. They would really be better left in the parent hive for a longer period, except for the fact that the bees may have raised them from young larvæ, in which case they will be due to hatch on the eleventh or twelfth day. This method is even more likely to ensure success if the combs containing eggs, &c., are placed in the third story with a super of sheets of foundation or empty combs between them and the brood-chamber. In this case, also, the excluder should be placed on top of the brood-chamber. It must be borne in mind that no dequeening is required by this method. Another simple method, and one more easily controlled by the beekeeper, consists in placing a frame of eggs horizontally over the frames in the brood-chamber. This is best arranged for by placing an empty worker-comb in a strong colony and marking the date on the frame. As soon as the queen has laid in the comb the colony which is to be utilized for queen-raising purposes must be dequeened, and it is best at the time to remove all unsealed brood. This will ensure that all queen-cells will be raised on the specially prepared frame of eggs. If every second and third row of cells is pared down to the midrib, and only one in four of the cells in the remaining rows allowed to contain an egg, a greater number of queen-cells will probably be procured. However, the frame will usually be found quite satisfactory just as it comes from the hive without any paring or cutting. An empty frame must be procured and laid on top of the brood-chamber. On this the frame of eggs is laid and the whole covered with two or three mats. An empty super must be placed on the hive so that the frame of eggs will not be crushed when the roof is put on. The bees will draw the queen-cells downward, the empty frame allowing room for them to be developed to their full length. If only eggs are used, as suggested, the queen-cells may be safely left on the hive for thirteen or fourteen days after the introduction of the frame of eggs, by which time they will be ready for the nuclei. As soon as the young queens in the nuclei have laid a fair number of eggs they should be removed to replace a failing queen, and their places filled by more ripe queen-cells, until a sufficient number of young queens have been produced to renew the stocks in the apiary.

TREATMENT OF DISEASE.

As advised in the September issue notes, beekeepers should undertake treatment of diseased colonies as soon as weather conditions permit. All infected stocks should be dealt with so that they may build up in time to work the main crop. Usually at the end of November the weather is settled enough in all parts of the Dominion to carry out treatment, and in many districts the clover is yielding sufficiently to enable the beekeeper to treat successfully with a minimum amount of feeding. Poor honey crops are almost invariably the result of neglected and diseased stocks, and many beekeepers are apt to blame seasons instead of seeking the enemy within the hives. There is no gainsaying the fact that foul-brood is destructive of more colonies than starvation, and in too many cases the beekeeper is apt to treat the disease as of little consequence, only to wake up later on and find that it has decimated his stocks and reduced his returns to nil. For full particulars as to treatment see the Department's Bulletin No. 1, "Foul-brood in Bees."

WAX-MOTH.

From time to time advice is asked as to the eradication of this insect pest. Usually these moths are the enemies of the careless beekeeper and those who have not advanced beyond the box-hive stage. On the West Coast and in the Marlborough and Nelson districts of the South Island climatic conditions are favourable to the production of the smaller moth, and consequently beekeepers have to exercise eternal vigilance to prevent them from destroying the combs. It is the larvæ or grub which proves so destructive to the combs, burrowing through them under the protection of the silken galleries which they spin round themselves. Eventually the combs are destroyed and fall a mass of cocoons to the bottom of the hive. No better advice can be given for coping with these insect enemies than to keep all colonies strong and to Italianize the apiary. Italians are better able to contend with the pest than blacks. All old and failing black queens should be replaced with vigorous young Italians.

PREPARING FOR THE HARVEST.

Although extracting is still a few weeks ahead in most districts, the honey-house and appliances should be put into proper condition for dealing with the main flow. Any repairs necessary should be undertaken at once, all utensils scoured and sterilized, machinery oiled and overhauled, and, in fact, the whole outfit "spring-cleaned," so that operations may be commenced at short notice. Half the drudgery of extracting may be obviated by complete preparedness for the most important work of the season.

VITICULTURE.

By S. F. ANDERSON, Vine and Wine Instructor.

THE VINEHOUSE.

THE remarks made in last month's notes with regard to stopping the vines at the second leaf beyond the young fruit should be followed up. In those houses where the vines are not so forward there will still be some where the first stopping has to be done. In most houses, however, they will be flowering. Vines generally set their fruit without artificial help, but to assist them at this interesting and important stage a somewhat drier condition of the atmosphere is desirable. The pollen is a very light substance in all flowers, and where there are moist conditions it cannot be well distributed, at all events under glass. Vines outdoors set their fruit satisfactorily in moderately low and moist atmospheric temperatures. There are also many agencies for carrying out pollination outdoors not met with under glass. If a vinegrower has any varieties that in previous years have not set their fruit satisfactorily, these may be assisted by passing a plume of the pampas-grass (toe-toe) over them at flowering-time. Muscat of Alexandria is one of the varieties which may probably require this attention.

In some houses the fruit will now be large enough to thin. This should be done as soon as possible after setting—when the fruits are

about the size of green peas. If left till later there is an unnecessary waste of forces of the vine. Superfluous bunches should be removed as soon as the best bunches are determined. Loose shoulders are better cut off, as single-stemmed bunches are preferable. This applies to Black Hamburg, Gros Colman, Lady Downes, Gros Maroc, &c. Those with large loose bunches, such as West's St. Peters, Trebbian, &c., should have their shoulders carefully tied out. In deciding the amount of crop a vine should carry due consideration should be given to the size of the bunches in relation to the age, vigour, and length of the vine. In a well-established vine the weight of fruit borne when ripe should not exceed 1½ lb. to the foot in length of the rod. Mistakes are sometimes made in this respect in the case of the large-bunch varieties, with the result that there is a want of colour and proper development of the fruit. This lowers the selling-value considerably. Referring again to the thinning-out of the berries, the space required for each berry to develop varies from ¾ in. to 1¼ in., according to the variety of grape. A Gros Maroc should have 1 in., while Gros Colman requires over that. Judicious thinning does not reduce the weight of the crop, and adds very considerably to the value. This is a work which can be very well done by girls under the guidance of an expert. With a little practice their quick hands and keen vision enable them to become expeditious and satisfactory.

THE VINEYARD.

Black-spot (*Gleosporium ampelophagnum*) has made its appearance in a few places, though more prevalent in the vineyards of the North. It attacks leaves, wood, and berries with disastrous results. Although a fungoid disease, it does not show a mouldy appearance. It is, as the name implies, a black spot coming on the edge of the leaves and crumpling them up. On the young wood it soon eats into and causes a depression in those parts. Directly it is noticed the vines should be sprayed with bordeaux mixture, using the summer formula—3 lb. sulphate of copper, 4 lb. fresh lime, and 40 gallons of water (rain-water if possible). The efficiency of bordeaux mixture depends upon the intimate blending of the two solutions obtained by pouring both of them simultaneously into a third vessel. It is imperative that the chemicals used be pure and the lime fresh. The best results are obtained when the application is made as soon as possible after blending the two solutions. If allowed to stand for more than eight hours the fungicidal properties of the mixture largely depreciate. Up to the present bordeaux mixture is the only effectual remedy for black-spot. It may have to be applied several times during the season, according to weather conditions, but persistent work keeps the disease in check. A clean state of the soil around the vines is a great help in controlling fungoid pests. The vines get a reflected heat from the soil, and also a free circulation of air that a weedy state of the ground prevents. This enables the vine to dry quickly after rain.

Mildew (*Oidium Tuckerii*) is almost sure to make its appearance. This is a mould of a greyish-white appearance, and affects the tips of young shoots and fruit. It can also be seen in round patches on the under-side of the leaves. The remedy is sulphur. This is applied with a Vermorel sulphurator, which puffs it all over the plant. Fine dry weather with no wind are the conditions for doing the best work.

Another way of applying sulphur that has been highly recommended is tying up a few pounds in a piece of hessian or double thickness of scrim and shaking it well among the leaves, &c.

THE GARDEN.

By W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

Seeds of cabbage, broccoli, savoy, and various kales may be sown up to the end of November. This sowing is to provide for the winter supply; therefore provision should be made for proportionally large plantings. With regard to cabbages, any of the main-crop garden varieties are suitable if they are intended for table use only, but on farms they are often required for cattle also, in which case Drumhead should be sown, as these give large heads and stand the winter well. Several varieties of broccoli should be sown—early, mid-season, and late—so as to prolong the supply. Early varieties, such as Adam's Early, should come into cut in June. Late Queen may last out till December, when early cauliflowers come in. Mid-season varieties, such as Snow's Winter, Perfection, and others, come in between the two. If an early variety has previously been sown it will not be necessary to sow it now, the time stated being the latest reliable time for sowing. The kale family is not of much value except in places subject to a cold winter, as with the possible exception of the Drumhead varieties, which form a small solid head, they only make loose crowns of leaves, mostly closely curled. These are tough in texture unless well frozen. The drumheads are suitable for a wider range of cultivation, but even these are best when subjected to some few degrees of frost.

Coming to December operations, peas should be sown for succession. If the soil is dry, water the drills thoroughly after the peas are sown in the way described earlier. The practice of soaking the seeds in water before sowing them in dry soil is a bad one. Silver-beet is a useful stand-by in case cabbages are destroyed by the diamond-backed-moth larvæ, being unaffected by this pest. Sow in rich soil, and thin to 10 in. or 12 in. apart. French or butter beans should be sown. Lettuces may be transplanted and seeds sown. Sow in lines thinly, and thin out the plants to 8 in. or 10 in. apart. When transplanting draw a shallow drill, and plant in the bottom of it; thus the dry surface soil is avoided, and when watering is required it can be effectively done, as the drills will convey it to the roots. Sowing of parsnips, carrots, and red beet in quantity for winter use should be no longer delayed, or they will not attain a useful size. Onions for pickling should be sown as advised last month. Turnips may be sown as required, the rule being to sow again as those last sown begin to come into use.

Asparagus-cutting should now cease; peas having come in, asparagus should not be required. The crop next season depends on a sufficiency of growth being left to mature. If the soil is not well supplied with manure a top-dressing will be beneficial. A dressing of nitrate of soda, 1 oz. to the square yard, will help growth. The growth on young beds should be carefully preserved. In some cases it may be necessary to

tie the plants to stakes to prevent their being broken off by wind, but in most cases it is sufficient to pinch the tops off so as to prevent them getting too tall. The side growths on the different stems will then develop, and by locking together afford mutual protection against wind.

Potatoes: Where the potato-moth is troublesome arsenate of lead should be added to the necessary bordeaux spray, and be applied before each moulding, taking care that the spray reaches the stems of the haulm near the ground-level. Moulding up should be very thoroughly done. If the soil is at all lumpy it would pay to go along the rows after plough-moulding and draw the soil close in to the haulm. High moulding is necessary to make it difficult for the moths to lay their eggs low down. Carefully cover all the tubers, for the moth prefers to deposit its eggs on them, and will do so unless they are well protected.

Celery: Early plants should be ready for planting out. It is a common plan at the present time to grow celery on the flat instead of as heretofore in trenches. The plants are set in compact order at a distance of about 8 in. each way. The soil must be rich and plenty of water available, celery, above all other plants, demanding abundance of water. Under this system earthing up in the ordinary way is not possible, though some growers run boards along and throw some soil in around the plants. Usually this is not done. Self-blanching varieties are grown, and if good growth is made, so as to exclude a good deal of light, the plants are fairly well blanched. To grow really good heads, however, the trench system must be adopted. A trench is taken out a spit deep, and the loose crumbs shovelled out. A good layer of well-decayed manure is dug into the bottom, and the plants set 8 in. apart. The plants may be in single or double rows; in the latter case each pair is set side by side; the single row gives the largest heads. After a trench is planted it must be well watered. Lay a hose in if possible, and fill the trench the height of the plants if it will hold. If the soil is too porous to hold water give enough to thoroughly soak it. Celery-leaf rust is troublesome in some parts, mostly the warmer districts. Where this disease is expected the plants should be sprayed with bordeaux, 2–2–40, before the trouble appears, and after every second week till the plants are fully grown. Once the disease obtains firm hold it cannot be cured.

Thinning rows of seedlings of all kinds that require it should be done as soon as the seedlings are large enough to handle. The plants cannot develop properly without light and air all round them; this they cannot get while crowded, which soon causes them to become drawn and spindly. Keep the hoe going as often as possible, particularly after rain, which closes the surface, and on first sight of weeds sprouting up. Plants require air at the roots; loosening the surface admits it, and is often better than giving water or manure. A loose surface acts as a mulch and prevents loss of moisture by evaporation. It is easy to keep ground free of weeds by timely hoeing, but to get rid of weeds after neglect may cause much labour.

In places where the surface soil is very dry at sowing-time it is best to assist germination. The practice of watering seed-beds after sowing is bad; so also is it bad to soak the ground with water before sowing (as is advised by some writers); in either case the moisture is quickly evaporated. The best way is to sow in drills, and water the drills well through the rose of a watering-pot after the seed is sown but before closing the drills. The dry soil that fills the drills acts as

a mulch; it prevents evaporation, and the moisture is retained long enough to germinate the seeds. Where the best results are expected the numbers of plants required should be drawn from the seed-beds as soon as they are large enough to handle, and be pricked out in nurse-beds of good soil, placing them about 4 in. apart. Here they will develop into sturdy well-rooted plants, and may be expected, if after-treatment is right, to give the best of their kind.

AREAS UNDER WHEAT AND OATS.

THE appended statement was issued by the Government Statistician, under date 1st November, 1918:—

As was done in 1916 and 1917, cards were again sent out by post to grain-growers throughout the Dominion, asking them to state what areas they had sown or proposed to sow in wheat and oats this season. The subjoined estimates are based on the figures obtained by a tabulation of the cards returned.

WHEAT AND OATS.—ACTUAL AREAS, 1917–18; AND AREAS ESTIMATED AS SOWN OR TO BE SOWN, 1918–19.

	Wheat. Acres.	Oats. Acres.
Areas, 1917–18: For threshing	280,978	156,202
For chaffing, &c.	2,258	311,316
Total harvested	283,236	467,518
Not harvested	2,835	20,658
Grand totals	286,071	488,176
Areas, 1918–19 (estimated):—		
North Island	5,363	51,800
South Island	220,000	408,800
Total	225,360	460,600

Growers were this year asked, in addition to areas, to state varieties of wheat sown or intended to be sown, and the following table gives a summary of results in cases where varieties were specified:—

	Tuscan or Long-berry.	Hunter's (Varieties).	Velvet or Pearl.	Total Specified Varieties.
	Acres.	Acres.	Acres.	Acres.
North Island	1,065	737	41	1,843
Nelson, Marlborough, and Westland	1,103	329	49	1,481
Canterbury	73,552	18,493	9,350	101,395
Otago and Southland	8,885	4,257	6,059	19,201
Dominion	84,605	23,816	15,499	123,920

The Fulghum Oat.—An outstanding feature of the oat-variety trials at the Ashburton Experimental Farm last season was the position taken by Fulghum, a new oat multiplied at the Central Development Farm, which yielded 40·4 bushels per acre—10 bushels over any other variety, the general yield being low. Its growth throughout denotes it as a very promising variety for green feed or chaffing purposes.

ANSWERS TO CORRESPONDENTS.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

FOUNDER IN HORSES.

"NEW CHUM," Cust :—

Please supply me with some information in regard to founder in a horse. One of my horses has been very lame in the two front legs for some time, and my neighbours tell me it is foundered.

The Live-stock Division :—

Founder, or laminitis, in horses may be brought about by a variety of causes, such as overexertion, rapid changes of temperature, or unsuitable food; also by any other influence which will interfere with the proper circulation of the blood, resulting in congestion, especially at the extremities, and usually followed by acute inflammation and sometimes destruction of the affected parts. Thus it is of common occurrence to see a mare which has not cleansed promptly developing founder, or an animal that has been allowed to drink too much cold water when very hot. A heavy feed of anv substance to which the beast has not been accustomed may also produce the same effect. In acute founder the pain is very severe. This is principally due to the hard wall of the foot allowing of no swelling of the inner structure, which has become congested. The animal therefore prefers to remain in a standing position with the hind legs drawn well underneath the body, thus taking some of the weight off the fore legs, or else to lie down. General treatment must be upon the lines of stimulating the blood-circulation within the feet in order to relieve the congestion there. This can be done by freely bleeding the animal, by local bleeding, or by heavily covering the body, thereby inducing a flow of blood to the skin. In the early stages forced exercise and laxatives are useful, while hot poultices applied to the feet will relieve the extreme pain to some extent.

PASTURE MIXTURE FOR BUSH FARM AT PIRONGIA.

"HUIA," Makahu :—

Would you kindly tell me what is the best grass-seed to sow on a farm at Pirongia which I have recently bought. There is some natural clearing which is all fern, and some of the bush has been felled, but the grass is very poor. Although the bush is tawa, hinau, pukatea, and rimu. It is quite rotten enough to burn a second time if the season is dry enough. It is country that when stumped is all ploughable or nearly so.

The Fields Division :—

Cocksfoot, crested dogstail, and Poa pratensis should do well on the land you describe, but the rye-grasses will not hold for any length of time. Paspalum is also becoming popular in the district, but as the land will be later ploughable we should not be inclined to sow any unless the soil is distinctly inferior. Clovers thrive remarkably on fern land for a few years, and a fair seeding of them should be made in any mixture used. We would suggest a mixture somewhat as follows: Cocksfoot, 12 lb.; Italian rye, 8 lb.; crested dogstail, 2 lb.; timothy, 2 lb.; Poa pratensis, 2 lb.; red clover, 3 lb.; white clover, 2 lb. If the land is too poor for timothy substitute 2 lb. of Waipu brown-top. If paspalum is used we would advise sowing from 1 lb. to 2 lb. per acre.

"FLYING-BEETLES" ATTACKING PEAR-TREES.

"INQUIRER," Te Puke :—

I have an acre of young pear-trees. In the last four seasons the flying-beetles have practically stripped them of leaves during October. They seem to eat all the foliage off any tree or shrub, but so far they have not touched apple or lemon trees. A neighbour who has some thirty-year-old pear-trees says that he has had no fruit during the last four seasons, during which time the beetle has been active, while previously the trees were laden. Spraying with arsenate of lead seems no good, for they come in countless thousands and cover the trees like swarms of bees.

The Horticulture Division :—

There are two families of the beetles to which you refer. *Odontria zelandica* is known as brown beetle, which is the imago of the well-known grass-grub. This beetle flies only by night. The most effectual means of dealing with them is to shake them off the tree on to a sheet of canvas, when they can be thrown on a rubbish-fire, or into a tub of water in which is a little kerosene; or pour boiling water on them after shaking them into a tub. The bronze beetle (*Eucolaspis brunnea*) is much smaller than the brown beetle, and flies in the daytime. This beetle can be caught in the same manner. It is a curious trait with both beetles that when shaken from a tree they make no attempt to fly, so they are easily captured. Arsenate of lead is certainly effective against them if used strong enough, though more than one spraying is necessary. It has been repeatedly used by us with good effect on trees of various kinds. The trouble is that the beetles usually attack peach and plum trees in preference to others, and these trees will not bear the arsenate-of-lead spray. You can spray pear-trees with 2 lb. of arsenate in 50 gallons of water. It may burn the foliage a little, but not seriously.

LICE ON COWS.

D. J., Dunsandel :—

What is the best remedy for small brown lice frequently seen in cows?

The Live-stock Division :—

On a fine dry day wash the animals well all over with a strong solution of soap and water, and after they are dry apply a mixture of fish-oil, 8 parts, and petroleum, 1 part. After the oil has been on for twenty-four hours it should be scraped off with a piece of hoop-iron, which will aid the hair to return to its normal appearance. Should any lice hatch out after this treatment a further application of the oil and petroleum should be given, but generally the one application is quite sufficient.

SPRAYING POTATOES.

"BLUESTONE," Kaitangata :—

I have been spraying potatoes for two years past, with bordeaux, 4–4–40, with good results. I usually spray three times, increasing the bluestone 2 lb. each time. My method is to go up the row spraying one side and doing other side on the return. I am using an Eclair knapsack sprayer with bordeaux nozzle, and usually use soda instead of lime. I usually sow an acre, so a larger sprayer would not pay. Will you kindly advise as to method of procedure; which is the best mixture, lime or soda, to use, and the average quantity required, say, for the second spraying on an acre in gallons, as I have been using about 136 gallons on an acre?

The Horticulture Division :—

Lime bordeaux is generally preferred to soda bordeaux, because the lime-mixture shows plainest, and is easily seen if any part of the haulm is missed. Soda is considered equally effective; 1¼ lb. should be used in place of 1 lb. of lime. It does not appear to be necessary to increase the quantity of bluestone as you say you do. An Eclair knapsack sprayer is a good machine to use for small areas. The quantity of spray mixture required to spray an acre must necessarily depend

on the size of the haulm. A power sprayer will use a smaller quantity than a hand-machine, because it cuts the spray into a mist, which covers better than a coarser spray. The important thing is to cover the foliage with the mixture without flooding it, which is wasteful. From 60 gallons upward will cover an acre. Probably the quantity you use is not excessive considering the machine you use, but less should suffice.

DRAINMAKING.

"MOWBRAY," Waharoa :—

Please inform me how to construct or make tea-tree drains. If parallel drains are made, say, 7 to 9 chains apart, should any cross-drains be required ?

The Fields Division :—

To construct manuka drains cut a channel in the usual way, tapering at the bottom to the width of a spade, and lay therein scrub to a depth of about 6 in., pressing it down firmly and evenly, and then replacing the earth. If parallel drains are from 7 to 9 chains apart it will be necessary for efficient drainage to make lateral drains every 2 chains, or, if the subsoil is very tenacious, 1 chain apart.

DOG WITH SKIN TROUBLE.

F. GILES, Te Arai :—

I have a four-year-old dog which has had the mange for twelve months. I have tried a lot of cures, but without success. The dog is quite healthy, but always biting the hair off his back. Would you kindly inform me as to the best remedy ?

The Live-stock Division :—

In all probability your dog is suffering from eczema, not mange, and as this is more difficult to cure than mange it may be the cause of failure of applications already used. We would advise you to change the dog's diet as much as possible, and make sure that he is free from internal parasites, by giving a dose of worm-medicine. Then apply all over the sore parts a 5-per-cent. solution of salicylic acid in olive-oil. Apply this once a day for three days, then leave alone for the next few days in order to observe the results.

DRESSING FOR SHEEP-SKINS.

R. WALKER, Alfredton :—

Kindly advise the best mixture for painting or dressing sheep-skins just after killing, also for protection from vermin.

The Live-stock Division :—

Any of the recognized arsenical sheep-dips will meet requirements, but the dressing is to be used four times the strength prescribed for sheep-dipping purposes.

BURNING-OFF FERN LAND.

"HARROWS," East Coast :—

Would you regard the constant burning-off of fern land as detrimental, and likely to cause impoverishment when it is finally required to be brought into grass ; or do you think the potash left by fires compensates for the loss of humus and other products of decayed vegetation ? This query refers to light lands only.

The Fields Division :—

The constant burning of light fern land will certainly result in a less fertile state of the soil than if left alone. The potash left by the fires will not compensate for other losses.

THE TARO-PLANT.

R. C., Mangapiko, Te Awamutu :—

I recently brought from the vicinity of Cape Brett about 50 lb. of taro-bulbs, which were growing wild on the banks of a stream. Will you please let me have any information as to their cultivation? Is the Waikato climate suitable?

The Horticulture Division :—

The taro (*Colocasia antiquorum*) is a tropical plant. It can be cultivated in the open air in the hottest parts of New Zealand, but requires lifting on the approach of frost and keeping in shelter till spring frosts are past. No special cultivation is required, but the plant requires good soil of fair depth and not too dry. Both the tubers and the leaves are edible—the latter as spinach, the tubers as potatoes. The tubers and leaves contain poisonous properties as well as acridity, and must be well boiled to remove these. In this country the plant is valued only for ornamental purposes, and probably will never be used for food. There is another Colocasia (*C. esculenta*), a native of South America, that has the same leaf-formation as the taro, but the leaves are at least twice as large and greyish in colour. This magnificent plant has long been grown in New Zealand conservatories.

DODDER IN LUCERNE.

P. W. G. C., Oamaru :—

I have a small patch of dodder in a lucerne patch: what is the best way to kill it out and prevent spreading?

The Fields Division :—

The best method of killing out dodder in lucerne is by spraying with bluestone. The spraying should be done each time the lucerne is cut, and again when the young growth is about 8 in. high. In this way dodder will be generally got rid of within a single season. The strength of bluestone to use is 1 lb. to 8 to 10 gallons water. At times a stronger solution, 1 lb. to 3 gallons water may be used. Such a strength will generally kill the dodder with a single application, but unless the lucerne is well established is likely to cause some harm. When dodder is present in only very small patches a successful method of control has been to cut out the affected area with a sharp spade about half an inch below the surface of the ground, then carefully remove the soil and cut portions of the plants, and spread some fresh soil over the area.

GREASY-HEEL OF HORSE.

B. SKINNER, Cheviot :—

May I ask for some information regarding treatment for greasy-heel in a draught horse? It is an extreme case, as the hoof smells offensively, and during last autumn blow-flies gave great trouble to the animal, notwithstanding washes and even kerosene used by me.

The Live-stock Division :—

Greasy heels, when once well established, are most troublesome to cure, as the position of the complaint does not admit of the most essential part of proper treatment, both as regards keeping the heels free from dirt and wet, and in applying solution treatment by immersion for a few minutes. The trouble is really a form of eczema, and is to a large extent of hereditary tendency; when once the skin has become broken a specific organism gains access and penetrates deeply, causing the condition seen and felt. Regarding treatment, many remedies have been found beneficial, but come short of an asbolute cure in most cases. We would recommend you to try any of the following: A strong solution of permanganate of potash; a 5-per-cent. solution of formalin; or sulphate-of-zinc solution; the part to be well soaked. Of the ointments, oleate of lead has been found very useful. Any of these remedies should be applied thrice weekly. To keep away the blow-fly a solution of aloes would be useful.

MAKING OF HOTBEDS.

"UTILITY," Richmond :—

In the making of hotbeds of stable manure of wheat-straw would it be advisable to use cow and horse manure mixed or separate? I am informed that professional gardeners for their hotbeds avoid wheat and always bargain for barley straw. Is there a reason for this preference?

The Horticulture Division :—

Cow-manure should not be used for hotbeds, either mixed with horse-manure or separate. Cow-manure will not provide a lasting heat. Even horse-manure will not provide a good hotbed unless the horses are corn-fed. We are quite sure that professional gardeners as a body do not bargain for barley-straw for hotbed manure, but use what they can get. The kind of straw is of no consequence. All depends on the proper treatment of the manure by turning over and causing equal fermentation.

UNTHRIFTY PONY.

"SUBSCRIBER," Glenavy :—

I have a nine-year-old Arabian pony who does nothing but go round the sheep once a day, which takes about half an hour. He has plenty of good feed summer and winter, but keeps very thin, and is generally very loose, except in the dead of winter, when he is entirely on chaff. I never see any worms he passes, and he is always eating and seems to be everlastingly hungry. Kindly advise.

The Live-stock Division :—

The condition of your pony is most likely due to weak digestive organs, and we would advise you to have the teeth thoroughly examined with a view to detecting any irregularity which might interfere with the proper mastication of its food. Even during the early summer, however, or when there is a flush of grass, we would advise you to continue with some dry feed, such as oaten chaff or hay.

LEAKAGE OF MILK IN HEIFER.

A. E. LOGAN, Otahuhu :—

I have a Jersey heifer which, after being calved about two weeks and giving from 28 lb. to 31 lb. milk daily, began to lose it badly. The milk began to drip away about four hours after milking, and at times squirts from all four teats at once, the loss being from 4 lb. to 8 lb. daily. Information how to prevent the milk running away will be appreciated.

The Live-stock Division :—

You have either a promising heifer or what is termed a "free milker." Your best plan is to milk her three or four times within the twenty-four hours; the use of other preventive measures is to be deprecated.

LUCERNE COMBINATIONS.

J. WHITTLE, Kauwhata :—

I have an acre of lucerne, and got six crops last year, but it is too long idle in winter, and I was wondering whether some such grass as prairie-grass could not be sown with it, so that something would be grown in winter. I find that Hunter River is several weeks earlier than Marlborough seed. Can you tell me the reason?

The Fields Division :—

Experiments have been conducted with combinations of lucerne and various grasses, and in some cases a prairie-grass—lucerne mixture has been found satisfactory—30 lb. per acre of prairie-grass being disked in before sowing the lucerne. Ideal conditions for lucerne establishment are necessary when this course is adopted. The later growth of Marlborough lucerne you mention may be a matter of strain or of acclimatization.

IMPORTATION OF FERTILIZERS: QUARTER ENDED 30TH SEPTEMBER, 1918.

Kind.	Country of Departure.	Auckland.		Patea.		Wanganui.		Napier.		Wellington.		Lyttelton.		Dunedin.		Invercargill.		Totals.	
		Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£	Tons.	£
Sulphate of ammonia ..	United Kingdom	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	3
Gypsum	Australia ..	..	..	..	..	..	..	..	..	44	96	..	..	..	..	..	..	44	96
Nitrate of soda.. ..	Chile	..	..	..	..	..	..	..	..	..	..	..	..	150	2,553	..	..	150	2,553
Bonedust	India	400	2,266	..	..	..	..	..	..	..	..	..	..	..	..	..	..	400	2,266
Chardust and bone char ..	Australia ..	100	563	..	..	..	..	..	..	..	..	..	..	..	..	..	..	100	563
Guano and rock phosphate	United Kingdom	..	..	..	..	..	..	..	..	..	10	..	..	..	..	..	..	..	10
	New Caledonia..	304	617	..	..	..	..	..	..	775	2,131	..	..	1,389	2,202	..	..	2,468	4,950
	Makatea Island	4,325	7,154	..	..	..	..	..	..	..	..	..	..	4,145	6,839	4,000	6,600	12,470	20,593
	Total ..	4,629	7,771	..	..	..	..	..	..	775	2,141	..	..	5,534	9,041	4,000	6,600	14,938	25,553
Superphosphate ..	Australia ..	939	4,649	80	433	680	3,553	..	..	1,802	9,714	763	3,964	346	1,853	454	2,333	5,064	26,499
Sulphate of potash ..	India	..	..	..	..	..	..	..	..	30	1,028	..	..	..	..	..	..	30	1,028
Sulphate of iron ..	United Kingdom	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1
	Australia ..	..	..	..	..	..	..	..	..	..	..	10	106	..	..	..	..	10	106
	Total ..	..	..	..	..	..	..	..	..	..	..	10	107	..	..	..	..	10	107
Other phosphates ..	Australia ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	120	383	120	383
Other manures .. .	United Kingdom	..	..	..	..	..	..	..	..	..	9	..	..	..	3	..	..	..	12
	Australia ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	*Less 120	*Less 383	*Less 120	*Less 383
	Total ..	..	..	..	..	..	..	..	..	..	9	..	..	..	3	..	..	*Less 120	*Less 371

* *Vide* June quarter return, in which included in error.

NOTE.—With regard to the "declared values" which are given above, the Comptroller of Customs supplies the following explanation: "The value for duty is defined as the fair market value in the country whence the goods are imported, plus 10 per cent. As the addition of 10 per cent. does not nearly cover the present freight, insurance, and other charges, the statistical value is a long way less than the actual landed value."

THE SEASON'S LAMBING: NORTH ISLAND ESTIMATE.

FOLLOWING is an estimate of the current season's lambing in the North Island, compiled from estimated average percentages of lambs dropped, furnished by the Department's Inspectors of Stock in the various districts. Corresponding figures for the three previous years are also given for comparison.

Year.	Number of Ewes put to Ram.	Estimated Average Percentage of Lambing.	Estimated Number of Lambs.	Actual Number of Lambs tailed.
1918 ..	6,846,049	85⅝	5,881,682	(Not yet collected.)
1917 ..	7,475,418	87½	6,539,033	6,354,249*
1916 ..	7,230,450	85¾	6,203,726	6,212,573
1915 ..	6,643,567	86½	5,753,329	5,771,143

* Interim figures.

Similar estimates for the South Island will be published in next month's *Journal*.

THE DEPARTMENT'S EXPERIMENTAL STATIONS, ETC.

THESE establishments, together with their location, leading features, &c., are as follows:—

Central Development Farm, Weraroa; railway-station, Levin. Dairying, stock-grazing, and general farming.

Ruakura Farm of Instruction, Hamilton East; railway-stations, Frankton Junction, Hamilton, or Claudelands. Dairying, stock-grazing, and general farming. Orchard; poultry section; apiary.

Moumahaki Experimental Farm, Moumahaki; railway-stations, Moumahaki or Waverley. Dairying, stock-grazing, and general farming.

Te Kauwhata Horticultural Station, adjoining Te Kauwhata Railway-station, Lower Waikato. Fruit and vine growing; wine-making; fruit-farm settlement; black-wattle plantations, bark-mill, &c.

Arataki Horticultural Station, Havelock North; railway-station, Hastings. Fruit and vine growing, &c.

Tauranga Horticultural Station, Tauranga. Fruitgrowing (including citrus fruits). Queen-rearing apiary (in formation).

Ashburton Experimental Farm, Ashburton. General cropping—cereals, roots, fodders, &c.

The establishments are open to visitors on any day except Sundays, Good Friday, Christmas Day, and New Year's Day.

Lesser experimental areas which may be visited include the following: *Gore*, general cropping; *Marton*, general cropping; *Albany* (gum lands, near Auckland), grasses, fodder plants, fruit-trees, &c.; *Puwera* (gum lands, near Whangarei), grasses, fodder plants, pasture, &c.

Standard Size for Butter-boxes.—Under an Order in Council dated 22nd October, 1918, a standard size is fixed for butter-boxes for exportation from New Zealand, as follows: Rectangular boxes with inside measurements of 15⅛ in. by 10⅛ in. by 11¼ in., and outside measurements of 16⅛ in. by 11⅛ in. by 12¾ in. The regulation came into force on 1st November, but butter packed in readiness for export in non-standard boxes before that date may be shipped with the consent of the Minister of Agriculture. In effect, the regulation makes the oblong box the standard export butter-package of New Zealand, and rules out the cube box hitherto used by a small minority of factories.